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Some Recent Illustrative Works.

THERE has probably been no period when there were so many illustrative books of architecture brought out, and of so high a class generally, as in the present day. If some critics think we have forgotten how to build in these days, we at all events know how to draw buildings, and the collections both of measured drawings and of picturesque views of architecture drawn by architects during the present generation will be regarded by our successors as a very noteworthy contribution to the illustration of the architecture of the past. We are speaking here not of books which have a special literary value,—essays on history or topography accompanied by illustrations,—but of books which are of value as collections of illustrations, apart from any literary matter in connexion with them. We noticed one at some length the other day, a work on sepulchral monuments, which, as dealing with a subject which has not received much systematic illustration, seemed to claim special attention; and we have three others now before us, each with a special interest of its own.

Mr. Ernest George's book of views in Venice,* represents that type of architectural illustration in which the architectural and the purely artistic elements are combined in about equal proportions. His etchings are all of architectural subjects, but they are of value not so much as representations either of architectural topography or architectural detail, but as artistic pictures from architectural materials. Etching is a form of execution peculiarly suited for this artistic treatment of buildings. It is not the best method by which to give their detail as it would strike an architect. But it is one of the very best mediums for rendering the picturesque and poetic aspect of architecture, the expression of its deep shadows and its broad sun-lit masses. In searching in Venice for examples of architectural effect adapted to treatment by etching, Mr. George has in the main avoided the most well-worn ground. The only one of the prominent and world-renowned architectural features of Venice which he has included among his subjects is the Dogana and Santa Maria behind it, from the lagoon, which he has treated in a manner characteristic of etching, the buildings with their solid masses and deep shadows forming the only worked-up portion of the picture, the sky and the water hardly touched, the latter only sufficiently to give the requisite effect of reflection. Etching in its purest form is taking darks out of a pervading light, just as engraving in its purest form consists in taking lights out of a pervading dark; and a subject for etched effect is pre-eminently one with plenty of light in it, broad masses of light which can be passed over almost untouched by the needle and give the full value to the darks which are worked out of the plate; and there is nowhere greater scope for an effect of this kind than in a place like Venice, where water, with its wealth of reflected light, pervades every scene, and leaves the etcher so many opportunities of broad and striking contrasts of light and shade. The Rialto nominally forms one of the illustrations, but it is not the familiar view of the whole bridge, but a drawing showing one end of the bridge and one of the approaches to it. In the other illustrations we are taken into the smaller canals and under the shade of gloomy old walls and dark little bridges, not showing much architectural detail that is of any special interest, but full of the artistic incidents of light and shadow to be found in such combinations of houses, bridges, and water, the possible beauty and poetic suggestiveness of which are, perhaps, better realised by the medium of drawing than by the sight (and smell) of the scenes themselves. The bridge behind the Fondaco dei Turchi, with the picturesquely corbelled out balcony or gangway on the right of the picture, is one of the best of these back canal drawings; the next, the Rio de Baratteri, with its perspective of bridges, is nearly as good, only the bridge crossing the front of the scene is a little too black and loaded for the rest of the drawing, on which it forms rather too prominent a black space. One of the best points in this drawing is the excellent rendering of the character of the long poles rising out of the water on the left,—two of the well-known painted poles used for boat-mooring and as "fenders"; the rather bent line of these long poles, and the way they rise out of the water, convey an idea of their mobility in comparison with the masonry adjoining; they seem to quiver in the water. The dark corner near San Stefano, with the mass of dark crumbling wall on the left and over the bridge, intensified in its grimness by the piece of sunlit building standing up white on the left, and the sky reflection from the centre of the canal, is another most effective picture. The view of the bridge from the portico of the Scuola de San Rocco is another which may be picked out as especially effective, particularly in the sunlit effect given to the bridge by the slight manner in which it is touched. The interior of St. Mark's is one of the least successful of the series, partly because the subject is one that does not take so kindly to etching as those out-door scenes amid the light of the waters and the sky: the effect is grim and dirty rather than rich; it seems to us that the surface has been too much covered, and that a more light and reticent touch, more of sparkle and less of covering the spaces with lines, might have been more successful. In general, however, this is a collection marked throughout by a perception of picturesque effect, as well as of the true powers of etching. The few words prefixed to each plate, on a separate page, hardly constitute anything that could be called a literary contribution to the subject; they serve to explain the plates, and it can hardly be said that the author is as picturesque with his pen as with his etching-needle. We may note one point, however; that Mr. George does not admit that Venice is so much spoiled as people say; he is moderate in his remarks about the steam launches,—"They are restricted to the Grand Canal, and they are a boon to the poor, who alone use them." Most visitors, who go either to sketch or write about Venice, regard it so entirely as a place made for their enjoyment of the picturesque, that we are glad to come across an artist who does seem to remember that there are native inhabitants, and that they have some rights of their own to improved accommodation and transit.

While Mr. George has been etching corners of Venice in this catholicity of spirit, Mr. Niven has been etching in different quarters of London with a more definite purpose, that of making a record of London churches which have been destroyed, and a practical protest against the threatened destruction of others. His volume* consists mainly of etchings, but with a few photolithographs, giving drawings of churches which have gone, from authentic sources, and drawings of those which remain, but whose existence is supposed to be threatened. Drawing with this special object, and with a view to exhibit the architectural qualities of each of these ungratefully-used edifices, Mr. Niven does not probably aim at anything like the artistic effect and broad contrasts of light and shadow which characterise Mr. George's Venetian sketches. His drawings of the exteriors of the churches included are clear and precise, not heavily worked up or shaded, but intended to show the architecture clearly, with a little effect given by touches here and there; one or two of the interiors, as that of St. Mildred's, Bread-street, are highly finished, and are good examples of what may be termed the engraving style of etching, and in the view

* Etchings of Venice. By Ernest George. London: The Fine Art Society. 1888.

* London City Churches, destroyed since A.D. 1800, or now threatened. Illustrated and described by W. Niven, F.S.A., architect; with eighteen etchings and seven photographs. London: Pettitt & Co 1887.

of St. Michael, Bassishaw, there is a striking effect obtained by showing the church tower white between an avenue of darkly-shaded warehouses,—a true etcher's effect. This is a book, however, with an object apart from artistic effect.

The buildings illustrated are all Wren's, and the author in his preface takes the conservative side unreservedly, and quotes various opinions as to the evil and barbarism of removing any of the old churches from the city. Among these is a rather far-fetched argument from Mr. W. Morris, that every loss of a church from the city is the loss of a part of a great design, "for it was, no doubt, in the mind of Wren that all the churches should form a support to the grand central mass of St. Paul's." We should doubt very much that there was any such definite idea in Wren's mind. A certain number of churches had been destroyed, and were to be rebuilt; and Mr. Niven himself remarks on a point which he thinks has been overlooked, that in rebuilding a church Wren, even while employing his own style, endeavoured to build it in somewhat the same general outline and proportion as before; if it had had a spire, he would create a spire in Classic form to replace, to a certain extent, that which was gone. We should think this both reasonable and right in itself, and very likely to occur to Wren; but it is not in favour of the idea that he was regarding the whole of the new churches *en masse* as supporters to St. Paul's, but rather that he was regarding each on its own merits and the special requirements of the site. With Mr. Niven's conservative attitude, nevertheless, we are, as far as our feelings and preferences go, in entire sympathy; we would not willingly see a single church of Wren's pulled down if it could reasonably be avoided; but there are cases in which it can hardly be said that it could be reasonably avoided. We have nothing to do in these columns with religious or ecclesiastical questions as such; but we see as a matter of fact that many of these churches, owing to circumstances (chiefly the decline of residence in the City on the part of those who do business there), are practically empty and only keeping up a sleepy ceremonial service attended by a few persons; and in that case it needs either a very firm belief in the future resuscitation of daily worship in churches, or a decided value and interest in the architecture of the church, to justify people in saying that this or that church ought to remain intact as long as it will last, as an architectural monument, when the ground is so much wanted practically for other purposes, in a region which is yearly becoming more and more crowded. There are cases in which this ought to be said; that of St. Mary-le-Strand is one of them. To remove that would be to remove most of the picturesqueness of the Strand, for it is St. Mary's with its steeple which fills the vista and forms its architectural effect and interest. But take such a church as St. Ethelburga in Bishopsgate Ward (Plate 5 in the book), which Mr. Niven "greatly regrets is now seriously threatened"; it is certainly of interest historically, but is it otherwise a kind of building to lament over or make any scruple about removing for the use of the site for modern purposes? One can never see an old thing go without a pang; but there must be a limit to this kind of conservatism, and in a crowded city especially it is impossible that every building, merely because it is of historical interest, can be preserved independently of modern requirements.

Such a consideration, however, does not lessen,—on the contrary, it rather increases,—our debt to Mr. Niven for giving us such an interesting and well-executed pictorial memorandum of churches which have gone and churches which may have to go; and the illustrations afford an interesting group of examples of the simpler forms (mostly) of Wren's architectural treatment of churches; sometimes, it must be confessed, of his weakness as well as his strength. For instance, Mr. Niven laments over the destruction of the tower of All-hallows, Bread-street, which he speaks of as "decidedly handsome,"—a rather dreadful sort of phraseology for an architect to use. We must say that we cannot see much reason to lament the decease of a tower with such very weak general design and such *rococo* details,—garlands sculptured in relief over the belfry window, and long sticks of pinnacles with rosettes hanging down their sides: these things represent the poorest type of architectural detail, and it is better, on the whole, to forget that Wren ever did anything so bad than to struggle to keep them in existence in honour of his memory, or because they are there now, and have been there a long time. The interior of St. Mildred's, Bread-street, was well worth giving, and is worth preserving, if possible, as an example of one of Wren's admirably-treated domical interiors, in spite of the bad character of some of the decorative detail, which cannot spoil the generally fine design of the interior. St. Bene't, Gracechurch, and St. Michael, Crooked-lane, were towers of much more architectural value than All Hallows; in the latter Wren seems to have been imitating the outline and general disposition of a Late Gothic tower, and travestied the proportions of its pinnacles; in St. Bene't and St. Michael he was inventing spire-like terminations to the towers in accordance with his own taste and style, and was much more successful. Mr. Niven does not narrate the circumstances under which St. Bene't was pulled down in 1867, "to the disgrace," he says, "of all concerned." There may have been two sides to this matter also. St. Bene't Fink, destroyed in 1844, was a highly characteristic example, with its pentagon plan contrived for making the most of an awkwardly-shaped site, a relic which it was a great pity to have lost, as it illustrated a characteristic feature of Wren's practice, his ability in planning and in turning to account an unpromising site. The interior of St. Mary Abchurch, with its curious and effective arrangement of the pendentives under the dome, is done justice to in one of the best etchings in the book. The tower of St. Antholin, given on plate 14, goes far to vindicate those who protested against its destruction; it is one of the best designed of that type of Wren's towers which imitated Gothic lines and terminated in a spire; we may add, however, that it looks much better in Mr. Niven's cleanly-executed and delicately-finished drawing than it did in the reality,—in those latter days of its existence, at least, when it was darkened with soot and weather. We join with the author in regretting the destruction of St. Michael, Queenhithe (Plate 19), in consideration of the admirably characteristic arrangement of its windows,—a circular upper or clearstory window resting on the keystone of each of the lower windows; Wren's variety in this matter of the grouping of details was very great. The tower has character, too; but what would be said to an Institute or an R.A. student who were to submit such a design now?

Whether we agree or disagree with the views expressed as to the claims of all these churches to be or to have been preserved, there can be no question that Mr. Niven has done an excellent piece of work in getting together illustrations of those which have disappeared, and giving admirable drawings of those which are or may be threatened; in the latter case the illustrations may be of service in calling attention to their value (where they are really valuable) before it is too late, and, if the destruction is inevitable, in furnishing a record of them drawn from the actual building while yet existing. One or two of the illustrations we have made arrangements with the author to reproduce at an early date, both as examples of the book and of interest to themselves. Mr. Niven has added plans of some of the churches in which the plan has any special character, and also, what is of considerable interest, a plan of the City, showing the churches at the beginning of the present century,—those that are still remaining being shaded, those that are destroyed shown black. The plan serves to show at a glance that we have knocked a good deal more out of Wren's London than most people probably realise. We have every now and then the question coming up of whether a church should be removed, and people think "it is only one church, after all," but they would, perhaps, be surprised to see on this map how many are gone.

Mr. Niven's book is a holograph, in a sense; our next is a monograph, that of Long Melford Church,* by Mr. E. L. Conder. The Institute of Architects, Mr. Conder mentions in his preface, had for many years recommended Long Melford Church as a subject for their measured drawings competition; Mr. Conder's partial drawings of the church gained him a silver medal, and he wisely determined to carry through what he had begun. He has produced a very fine and complete monograph of a very remarkable church, one of the finest specimens of its date and style which exists. We visited it many years ago, that and the perhaps still finer church at Lavenham, in one day of glorious summer weather, and shall never forget the joint impression of the church and the scene in which it stood; the long elaborately-decorated building, and the long sloping lawn, which might be accepted as the village green, with a row of noble trees overhanging one side of it. The church is thus an old friend, but we should not the less have appreciated such an excellent and careful series of measured drawings as this in any case. The church is, as every one knows, of very late date and style, but it is an unusually rich example of a parish church of that date, and of unusual size, its appearance of external richness being increased by the extensive use of stone inlay in flint walling, as common in that district. The Lady-chapel, placed on one side of the east end (*i.e.*, it is of the width of the centre and south aisles, excluding the north one), is the most remarkable part of the church, and is full of rich and delicate work, both internally and externally; it seems to have been through an extraordinary history, having been converted in 1670 into "a publick schoole for Melford"; and after it lost this office it was entirely neglected, and in 1823 the windows were blocked up with lath and plaster, and the chapel used as a store-room and coal-cellar. Mr. Conder observes that the clearing off of the whitewash, and the repair of the inner roofs, is all that is now wanted to put the Lady-chapel into a reputable condition. It is to be hoped this may be accomplished. Mr. Conder shows the hideous western tower with strict accuracy. We cannot but wish the removal of that were made another part of the restoration. It is well worth pulling down.

Mr. Conder's monograph does not come under the category of those in which the literary text is a mere perfunctory accompaniment to the illustrations, for he has taken a great deal of trouble to collect what can be collected of the history of the church, and his book contains a good deal of interesting information as well as careful drawing.

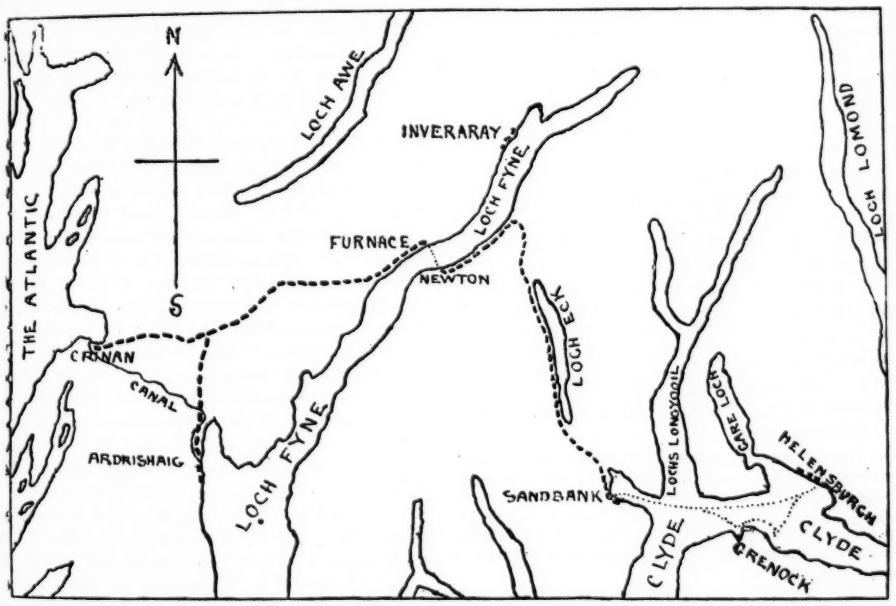
RAILWAY MAKING IN THE HIGHLANDS.

THE NEW ARGYLLSHIRE LINE.

THE mainland of Scotland to the north-west is so essentially mountainous, and moreover so cut up by transverse arms of the sea which in numerous cases penetrate many miles into the interior, that one glance at a map of the requisite orographic clearness seems to shut out definitely all prospect of the district ever becoming traversed by railways. And the region is withal so comparatively denuded of population, and so unproductive in merchandise much sought after in the southern markets, that, in this regard, but small inducement is held out to railway enterprise, even were the country an eminently accessible one, as it is the reverse. Fish, cattle, and sheep are the only important products in demand for distant markets, and the industries herein concerned have been greatly hampered in development owing to the very tedious modes of transit so long existent. But the north-west of Scotland, though otherwise comparatively poor, is very affluent in magnificent scenery; so affluent

* Church of the Holy Trinity, Long Melford, Suffolk. A monograph by E. Lauriston Conder, Architect. London: Dryden Press (J. Davey & Sons). 1887.

that, in large measure to assist visitors to an easier participation in these fine scenic effects, it is slowly but surely becoming pierced by the enterprise of the railway capitalist, aided by the ingenuity and plenitude of resource brought to bear by the railway engineer. The north-west coast is already touched at two points :—Strome Ferry, opposite Skye, by the Dingwall offshoot of the Highland Railway from the east coast ; and Oban, 60 miles to the south, by the farthest north-west reach of the Caledonian system, approach being made by way of Stirling, the Perthshire straths, and the Pass of Brander, Loch Awe. A Bill was sanctioned in last session of Parliament which will add a third point of touch with the outer ocean, namely, Crinan, on the Sound of Jura, in the track of an increasing stream of summer traffic, and long well known to travellers by the Royal West Highland route of the Macbrayne service of steamers. Crinan is fully thirty miles on a bee line from Greenock and Helensburgh, where may be said to terminate a variety of railway projections from Glasgow and inland, the Firth of Clyde and its numerous branching arms seeming here to bar all further progress to the west on the part of the iron horse. These impeding stretches of sea might certainly be "got round," in the engineer's sense, with the result of extending the railway system whose present terminus is Helensburgh, on the north shore of the Clyde ; but this so obviously involves a wearily tortuous track thrice or four times multiplied in length and cost, with no set-off worth mentioning in the way of additional traffic inducement, that such an expedient is not to be thought of, not at least simply and exclusively as a means of getting to the nearest Atlantic seaboard. The feat is to be attempted on another plan, the authors of which are Messrs. Formans & McCall, Civil Engineers, Glasgow. By a service of saloon passenger steamers of the highest Clyde class, with another service of railed truck-bearing goods craft superadded, the North British system, from the existing terminus at Craigendoran Pier, Helensburgh, with a call perhaps at Greenock and Gourock, is to be made to leap the ten miles of firth and loch barrier over to Sandbank on the Holy Loch, where the newly-designed Argyllshire Railway is to begin.



Here the untutored eye discerns nothing but huge mountainous masses barring the track-maker's way even more effectually than the broad firth water did ; but by hazarding a detour to the north through the narrow defile in which Loch Eck lies, a natural fault in an otherwise rigorously barricaded bit of country is made use of as a pass, and the banks of Loch Fyne are touched at Strachur after about fifteen miles of progress, and that without encountering a higher summit level than 120 ft. above that of the sea. From this point the head of Loch Fyne might have been doubled, at the cost of about thirty miles of added way, and with the part compensation of catching up Inveraray by the detour ; but Inveraray, though the county town, is really a very small place, and thirty miles of track in the Highlands mean a good deal of money. The loch is temptingly narrow, and it has been decided to "float" the metals over instead, and that almost in a literal sense. Before crossing however, the line,—a single one of the ordinary narrow gauge,—bends sharply round to the south-west down the loch side as far as Newton Bay, which is the chosen point of passage, with the hamlet of Furnace on the opposite side, a mile away. Newton Bay Ferry is one of the most notable features of the undertaking. The wider ferry between Helensburgh and Sandbank will (in the goods department of the traffic) be served by the North British Company's Burntisland and Granton truck-bearing steamers, now, and for a long series of years, successfully at work on the eastern firth, but destined to be relieved from east coast service altogether on the completion of the Forth Bridge, and the consequent discontinuance of the Burntisland ferry, so far, at least, as truck-transit is concerned. But the mode of transportation at the Loch Fyne crossing will differ widely from that so long in use on the Firth of Forth, and differ also from all other modes hitherto employed anywhere. Quite a new type of railed craft is to be provided for the service. Passenger trains as well as goods trains, and these in all cases accompanied by their respective locomotives, will run on board directly they arrive, steaming off on the other side also with a minimum of delay, the calculation being that fifteen minutes will fully suffice for the single mile of crossing, reckoning from the instant of train arrival on the one side to that of train departure on the other. Tide deviation at Newton Bay has 10 ft. as the extreme limit, and in order to meet the very stringent requirements of the Board of Trade as affecting permissible gradients on which to embark and disembark trains, recourse has been had to an ingenious contrivance. Some short distance away the single line of rails branches out into five separate tracks ; these arrive at the water edge abreast, so to speak, but on divergent levels, the difference being 2 ft. between each, or 10 ft. (the full range of the tide) between the highest and the lowest, an arrangement which, it will be seen, leaves at disposal one practicable level at all times of the tide. The ferry steamer is received into a kind of chair or dock, composed of a huge pontoon rising and falling with the tide, which pontoon is anchored, as it were, to a vertical pivot whose foundation is firmly imbedded in the rock below. Connecting the pontoon with the shore is a gangway, metalled, and identical in dimensions with the track itself. As the tide rises or falls the shore end of the gangway shifts and adjusts itself, automatically almost, one by one to the varying levels of the meeting tracks, the aforementioned pivot arrangement permitting the pontoon, with its embraced ferry steamer, to alter bearings for the few feet necessary at each succeeding change of tide-level. The metals of the steamer connect readily with those of the gangway, and the entire train steams easily on board, and *vice versâ*. This loading and unloading contrivance is, of course, duplicated on the other side of the passage. As another highly interesting feature it may here be mentioned that it is in contemplation on the part of the engineers to exact from the crossing locomotive the steam necessary to set the engines of the train-bearing boat in motion,—in short to cause it to "work its passage," the chief motive herein being a very nice minimising of the oncost charges of the service.

From Sandbank on Clyde waters to Newton Bay Ferry on Loch Fyne the distance by the chosen track is twenty miles, an excess of only about five miles over the direct distance, and a very reasonable result withal, considering the rather unaccommodating character of the surface of this part of the country. The steepest gradient is 1 in 50. Leaving Furnace, on the western shore of Loch Fyne, the line keeps the waterside for a short distance downwards, after which, parting with the loch on a gradually rising slant, it strikes inland, and shortly, with the aid of two trifling bits of tunnelling, clears the 400 feet summit level of this western section of the work, and at once commences descent to the Atlantic. The route here is through the beautiful Glen Add, a section which for grandeur of scenery is one of the finest of a very fine series. For about a mile the River Add passes through a very narrow gorge flanked by almost precipitous hills. Down this gorge the railway threads its way, the engineers having taken advantage of a mere foothold of margin, quite at the edge of the torrent, for the purpose of carrying their work through a pass which, to the ordinary observer, seems impassable. The scenic effect here will be magnificent. Fifteen miles from Furnace the seaboard terminus is reached on the shores of Loch Crinan, an inlet of the Sound of Jura, which in its turn is a readily accessible arm of the outer ocean. A fork five miles in length leaves the main line at Kilmichael Market (a noted emporium for Highland cattle, situated a short distance to the north-east of Crinan), and bending south-eastward, once more catches up Loch Fyne waters in order to find terminus at Ardrishaig, the centre of the Loch Fyne fish traffic, and forming the eastern mouth of the well-known Crinan Canal, as the other or main terminus (Crinan) is the western end of the same.

The financial scope of the work, which is to be styled the "Clyde, Ardrishaig, and Crinan Railway," is 180,000*l*., with borrowing powers to the limit of 60,000*l*. more. Operations are to be commenced early in the year, and it is reckoned that from eighteen months to two years will suffice for completion. Immense quantities of fish are captured in Loch Fyne and within the outer seas, and the line, although built primarily out of other inducements, will no doubt carry off a large share of this traffic, bringing perishable goods to suitable markets at a great saving of time, and with much thrift in the matter of labour in trans-shipping. From Newton Bay a steamboat service will connect with Inveraray, the county town, situated ten miles higher up the loch on the other side. The new railway has been privately promoted ; under agreement, however, with the North British Railway Company, who are to work it, and with the prospect, no doubt, of ultimate amalgamation, as in the case of the Glasgow Underground Railway.

NOTES.

SINCE going to press last week more full and explicit information has reached us as to the proposed excavations in Cyprus. The Society for the Promotion of Hellenic Studies has issued a preliminary programme. The

Society itself contributes 150*l.*, and the Managing Committee of the British School at Athens contribute the like sum on condition that the control of the exploration be in the hands of the Director of the School, Mr. Ernest Gardner, and that those who take part in the work enroll themselves as students of the School. Cambridge and Oxford send out respectively Mr. M. R. James and Mr. D. G. Hogarth, both names already known to archæology. Zoology and the interests of natural science generally are entrusted to Dr. F. H. H. Guillémard, and an architect, Mr. R. Elsey Smith (as was stated in our report of the Institute meeting last week), is to be sent out at the joint cost of the Royal Institute of British Architects and the British School at Athens. The British Museum, in the past and present, is represented by the active sympathy of Sir Charles Newton and Mr. A. S. Murray. Sir Charles Newton has long been unwearied in his efforts to call national attention to this archæological field. The Committee wisely refrain from stating precisely what sites they intend to begin operations with; ample discretion is to be left to Mr. Gardner when he reaches the field of action. His work at Naukratis has abundantly proved his capacity. Nothing seems wanting but money, and it remains to say that subscriptions may be sent to either Mr. Walter Leaf, the Hon. Treasurer, Old Change, E.C.; or to the account of the Cyprus Exploration Fund, at Messrs. Robarts, Lubbock, & Co.'s, Lombard-street, E.C.

AN enthusiastic writer in the Roman paper *La Riforma*, commenting on the law recently passed in the Italian Chamber for the preservation of national monuments, alludes in terms of admiration to the law passed in England in 1861 (he says, but he must be wrong in his date), punishing the destruction or mutilation of public works of art. He also refers to the Ancient Monuments Protection Act (Sir John Lubbock's Act), to which he attributes a scope and power which it is far from possessing. The English law, he says, provides that the cost of preserving national monuments shall be defrayed by the State; local inspectors are to be appointed to report on the condition of public monuments; persons defacing or injuring a public monument, are punishable with fine or imprisonment and the cost of the reparation; in the case of the offender being the owner of the monument he is judged as if he had no property in it; the several things in the schedule of the Act as well as the necessary space for preserving them are declared to be national monuments, and the Government have power to enlarge the schedule after the passing of the Act. The writer concludes by saying that in England every building, whether it be public or private property, is a national monument if it serves to embellish or to illustrate the history of the country. This will be news to most people here, and it would appear that the Italian author has not learned to discriminate between compulsory and permissive legislation, and has overlooked the fact that Sir John Lubbock's Bill does not deal with buildings at all. As regards the preservation of antiquities, England is far behind.

CLOSE on the announcement of the valuation of the metropolis for 1886-7 comes the report of the estimated requirements of the Metropolitan Board of Works for 1888. This amounts to the formidable sum of 1,805,849*l.*, of which 1,075,551*l.* is to be raised by rates. In consequence, the rate for the ensuing year is placed at 8·39d. in the pound, being more than four times the rate struck by the same authority in 1856, which was 2·09d. in the pound. The rateable value in 1856 was, in round figures, 11·5 millions; that for 1886, 30·5 milllons. The total incidence of metropolitan rates for 1884-5 was 6,531,317*l.*, of which 759,514*l.* was for the Metropolitan Board of Works. The rating of this body has, therefore, increased by nearly 42 per cent. in four years. The interest on borrowed money now amounts to 940,586*l.* in the year, being about the same figure as the addition made to the loan debt in the same time.

THE quinquennial increase in the gross rental of the metropolis has been little more than half as much between 1881 and 1886 as that which took place between 1876 and 1881. In the earlier period the increase was very nearly 21 per cent.; in the latter, it has been a little under 11·5 per cent. For the decade 1876–1886 the increase has been 36·6 per cent. This we may compare with the increase of population in the decade 1871–1881, which was 22·6 per cent. For the last ten years, therefore, the rise in rent has been by 60 per cent. more rapid than the increase in population; or, in other words, while each Londoner had to pay 6*l.* 5s. rent in 1876, he has to pay 7*l.* rent in 1886. In 1881, however, for which year we have both census and valuation, he had to pay also 7*l.* It remains to be seen whether there has been a diminution in the rate of growth of the population during the last five years, or whether there has been a real check on the steady increase of house-rent per inhabitant.

WE have received the prospectus of "The Italian Exhibition," to be held in the coming year, 1888, in the buildings and grounds lately occupied by the American Exhibition at Earls Court, Kensington. We are promised an "exhibition of the arts, manufactures, and products of the newest Great Power of the Old World, United Italy." This sentence, and some others in the prospectus, are perhaps due to the fact that the proposed Exhibition is being engineered (perhaps "bossed" would be the better word) by Mr. John R. Whitley, the "Organiser and Director-General" of the late American Exhibition, concerning which we could not find much to say at the time, from the almost utter dearth of exhibits of interest to our readers. Let us hope that the Italian Exhibition will be more worthy of a visit than was its American predecessor. Mr. Whitley says he believes that "the display in every branch of fine arts [*sic*] will be the most important ever made by Italy in a foreign country." Whether ancient or modern works, or both, are here included we are left in some doubt, probably because Mr. Whitley himself has no very clear idea on the subject, as may be inferred from the following paragraphs from the prospectus:—

> "It is impossible, until the various contributions are sent in and arranged, to state in what way and to what extent each constituent of the wonderful whole which the name of Italy brings before the cultivated mind is to be displayed in the capital city of the modern Italians' warmest national friends and allies.
>
> Suffice it to say, that from Etruscan tombs, from Rome and the Campagna, from the buried cities of Pompeii and Herculaneum, from the relics, Italian in origin and character, which the legions left behind them in these northern islands, ample guidance may be obtained for reconstructing something of that ancient life, the study of which forms so important a part of modern education. Every boy and girl who learns history, and every grown person who has heard of Virgil or Horace, is interested in this part of the subject."

Among other attractions, we are promised "models of celebrated Roman, Florentine, and Venetian buildings." This item alone, if adequately conceived and carried out, would of itself constitute a rather "large order." No doubt there is much which Englishmen would like to see in an Italian Exhibition, and we can only hope that the performance will be worthy of this preliminary flourish of trumpets.

ANOTHER of the liberal advertisements to architects who may be supposed to be willing to compete for anything or everything appears in our advertisement columns of this week; an offer of 5*l.* 5s. for a sketch design to the respectable dimensions of 4 ft. to an inch, for a front elevation in the old English half-timbered style. The designer is not to be engaged to carry out the work, but the advertisers want to get hold of his ideas at a cheap price. If they want anything worth having it is worth a great deal more than that, and all the answers they will get will probably be from needy persons of no standing in the profession, who will respond to any invitation of the kind on any terms. But this is nothing to another announcement in our advertisement columns to the effect that the Managers of St. Andrew's School, Guernsey, invite "School Architects and others" to send in designs for re-building their schools,—"5*l.* will be given for the best design." It is difficult to understand whether this is impudence or ignorance; we presume it is the latter. What sort of persons do the advertisers imagine will respond to that kind of invitation? Possibly some architects' pupils who want to try their hands, though we should doubt if even they would not think it beneath them. There is one point which the promoters of the school would do well to consider, viz., that it is their moral duty to build schools on the best sanitary principles; that it is a very great wrong to bring children into ill-constructed and ill-ventilated schools; and that it is out of the question that they can have the plans and advice of any competent person for the sum they are ignorant enough to offer, unless he gives it them out of charity.

IN the course of next month the Royal Academy will have three new Associates to elect. Mr. W. B. Richmond is spoken of as a very probable candidate, and certainly has high claims, though we have never been able to like his mannered style of portrait-painting. It is rumoured that there should be place found for an architect among the three; if so, Mr. Ernest George certainly has about the best claim among the outsiders. We know not whether it is contemplated to do tardy justice to Mr. Alfred Hunt by electing him an Associate; to our thinking, the justice would now be so exceedingly tardy that it would hardly be a compliment.

THE list of awards in the Art Department of the Adelaide Jubilee Exhibition is rather amusing reading. The prizes are distributed in classes of first, second, and third order of merit, and the manner in which the three degrees of comparison are apportioned is curiously significant of the attitude of the Colonial mind towards painting. Mr. F. G. Cotman comes into the first order, for "A Rebellious Sitter," Mr. Holman Hunt's "The Ship" is in the second order. This is not one of the best examples of what Mr. Holman Hunt can do, but to be let down to the second order of merit is sad indeed! Mr. Mark Fisher is let down to the third order; Mr. Faed (for "Seeing them Off") is advanced to the first order. The P.R.A. gets a first order; so does Mr. C. E. Perugini, while Mr. W. B. Richmond is reduced to the second order. In water-colours Mrs. Allingham is in the second order (!) while Mr. Callow and Mr. Dobson are in the first order, and Mr. Walter Duncan and Mr. Fulleylove in the third order! After this it may be said, what is the good of sending art to Adelaide? There seems to have been some enthusiasm for English architecture, however, for all the architects who are selected for awards are put in the first order. They are Mr. Aitchison, Mr. Jas. Brooks, Mr. Edis, Messrs. Ernest George & Peto, Mr. T. G. Jackson, and the "Royal Institute of Architects" generally for "a series of Photographs of Buildings erected from designs by Members and Associates of the Royal Institute of British Architects." This is satisfactory so far, and English architecture ought to feel complimented; but the pictorial awards certainly "give us pause."

CABLE tramways have not as yet found much favour on this side of the Atlantic, but there are places where horse-power is inapplicable, and the cable becomes a necessity if a tramway is to be constructed. Edinburgh, being a city built upon hills, is one of these places. The steep gradients between Princes-street and the northern parts of the city have proved most trying to horses, and it is really pitiable to see an omnibus, drawn by three or four horses, toiling up the steep incline from Pitt-street or Stockbridge. A complete cable tramway, between the southern end of Hanover-street and the northern end of Inverlith-row, has just been completed. The length of the cable is 17,000 ft., and its approximate weight twelve tons. It is made of crucible steel wire,

3 in. in circumference. The engines are situated in Henderson-row, and the cars provided are each fitted for the accommodation of sixty persons. This additional facility of access to the vicinity of Newhaven, Trinity, and Granton will doubtless be gladly taken advantage of, not only by the inhabitants, but also by visitors to the city, and it may also give a stimulus to building operations in and about these marine suburbs.

ALTERATIONS have been effected in Dr. Rowand Anderson's design for the Buccleuch memorial, in order to fit it for the reception of Mr. Boehm's statue of the Duke, which has now been set up in its place. The statue is enveloped in canvas, awaiting the day when it will be unveiled, for which ceremony arrangements are being made.

A BOOK on "Detail and Ornament of the Italian Renaissance" is to be brought out shortly by Mr. Batsford, consisting of drawings made by Mr. G. J. Oakeshott. The author says his object has been to bring together a collection of fine examples of Italian Detail in a small compass, such as may be useful to architectural students and art workmen, taking the examples from notable buildings, but avoiding such as have already been much illustrated. Mr. Oakeshott's ability and painstaking qualities as a draughtsman will ensure a good execution of the examples selected, and the book will, we hope, be one of considerable interest and value.

THE late Dr. William Chambers, of Edinburgh, during whose occupancy of the civic chair the last City Improvement Act was carried through, and who, after the expiry of his tenure of office, restored, at his own cost, the Cathedral Church of St. Giles, is to be commemorated by a statue erected to his honour. The site chosen is in Chambers-street, which is the most important of the improvements effected under his auspices. The statue is to be of bronze, 10 ft. high, placed upon a stone pedestal, and a sum of 1,000*l.* is to be expended upon it. It is proposed that the work should be thrown open to competition among British sculptors. The late Sir George Harrison, another chief magistrate of the city, is to be commemorated by the erection of an ornamental gateway at the eastern approach to Blackford Hill, which was secured by Sir George as a public park when he was Lord Provost. Out of a number of designs submitted, one by Mr. Sydney Mitchell has been accepted. A monumental character will be imparted to the gateway by the introduction of a bronze medallion of Sir George Harrison, after the bust in the Council Chamber by Mr. Charles M'Bride, sculptor.

THE *Bookbinder* for December 23 gives four examples of recent bindings or covers specially designed for various publishers, of which, however, one only has any merit at all, the remainder being merely coarse sprigs of flowers, &c., with no design of any kind in them. The one which has something of artistic effect is Miss Orrinsmith's design for a Tennyson, bound by Jas. Burn & Co., for Macmillan & Co.; this is a diaper design in gold on a black ground,—the kind of thing which Rossetti initiated in the design for binding his own poems: it represents an oak leaf and an acorn alternated, but the leaf is poorly designed, and the whole thing rather thin. If this is the best that can be produced of contemporary binding, we are in rather a poor way. One or two fine illustrations of old buildings are given as usual: the *Bookbinder* will form as it goes on an interesting repertory of these.

THE collection of drawings by Mr. Russell Dowson, chiefly illustrative of Eton, at the Galleries of the Fine Art Society, is well worth looking at. The topographical interest of many of the Eton scenes, showing various corners of old picturesque buildings, is considerable, and the execution and artistic feeling of these drawings is of a high standard. We may mention especially "Arch into Playing Fields" (1), "The Rafts" (2), "Old House in Weston's Yard" (8), "Head Master's House from Weston's Yard" (17), "Slough Road looking North" (37). Mr. Dowson is, we believe, connected with the school as a teacher of art, and has made a very good use of his opportunities in giving these pictorial illustrations of Eton.

THE collection of foreign pictures at the Goupil Gallery is not a very remarkable one, though it contains some good things. There is a large work by Professor Müller, representing the Courtyard of the Doge's Palace in old Venetian days, with a group of Oriental visitors; it is drawn and painted with the artist's usual learning, but the arrangement of the figures is theatrical, and the prevalent tone of the architecture dull and unreal. Artz's "Orphelinat de Katwyk" is a very good interior and figures, of similar merit to some others that we have noticed by the same artist. There is a Gerôme, fine in its way, "Awakening," but even more than usually devoid of feeling or sentiment. Among other works that may be mentioned are two very good little pictures of Venetian canal scenes, by Signor F. del Campo; "Breakfast on the Banks of the Seine," by Mr. Ridgeway Knight, equally good in landscape and figures; "Grandmother's Comfort," by Israels (not a very good specimen of the master); pictures by Daubigny and Dupré, of which the same may be said; a Corot, "The Storm"; and "Salomé," by M. Carolus Duran, a picture showing some very fine painting, though very unattractive.

THE PANAMA CANAL.

MR. H. B. SLAVEN, the chairman of an American Dredging Company, which has been engaged in the shallow waters at the Atlantic end of the Panama Canal since the commencement of the works, has given an opinion as to the general state of the enterprise, which is published at length in the *Bulletin du Canal Interocéanique*, under the heading "Une Opinion Compétente." The facts stated or admitted by Mr. Slaven are of value as being the evidence of a strong supporter of M. de Lesseps, and one who has a deep personal interest in the continuance of the works for which he contracts.

Mr. Slaven, by way of introduction, repeats the familiar statement that the Canal is more than half made. As the last return of excavation given in the *Bulletin* only amounts to 39,000,000 out of an estimated total of 150,000,000 cubic mètres, it would seem that Mr. Slaven is regarding the lengths taken in hand by contractors rather than the bulk of earth moved. There is now, he tells us, a length of 20 kilomètres open to ships drawing 15 ft. of water. This depth, it appears from the section published in the *Bulletin*, is only three-fifths of the designed depth; and in many parts the 11 ft. left in consists of hard rock, which cannot be dredged without blasting. We pass over any estimate of what will be done at any future time, as well as the comparisons made between the efficiency of French and American contractors. The total contents of the first 20 kilomètres, measured from Colon, do not exceed, according to the detailed estimates given formerly in the *Bulletin*, ten millions of cubic mètres, or one-fifteenth part of the total cutting, so that the amount actually dredged in the seven years during which operations have been going on is not by any means overwhelming. It requires some explanation to justify the statement that more than half of the work is done.

"There remains," says Mr. Slaven, after some remarks in the future tense on other parts of the line, "a section of the length of 25 kilomètres, which includes the crest or dorsal spine of the isthmus. The heights vary from 50 ft. to 387 ft. above the mean tidal level"; that is to say, that the cutting will vary from 76 ft. to 413 ft. in depth. "After mature examination, after having reckoned that this will take more time and will cost more money than he at first supposed, M. de Lesseps has concluded that he must enable ships to cross the isthmus in the shortest possible time. For that he has modified his plans by constructing temporary locks for this section, and he will thus gain much time for the opening of the Canal." Mr. Slaven continues that this is the same course that was taken with the Suez Canal,—a comparison than which nothing could be more misleading. There are no locks in the Suez Canal, nearly the whole of which is made through sand easy to dredge; and the deepening of which, by the same method by which it was commenced, was a very simple and easy operation. In the Panama Canal, the 100 ft. or 120 ft. which it is proposed to leave in below the "temporary" waterway consists mainly of rock, and its removal could only be effected by a repeated series of very costly operations. Meantime, the "temporary" line would still have to be carried through a cutting from 293 ft. to 313 ft. deep at the summit.

Being asked how many "temporary locks" were to be made, Mr. Slaven replied that this was not yet determined. He supposed four. M. Eiffel, who is called "the constructor of the tower of 300 mètres at Paris," is to be contractor for these works, "which will be made principally of iron, and worked by hydraulic force." These data would give a lift of from 50 ft. to 60 ft. to each lock, involving a water-pressure the resistance to which would be questionable even for the most solid works, and which would at once sweep away any lock which it was attempted to construct, as proposed by M. de Lesseps, *dans les barrages même*. The largest lock in the world is at St. Mary's Falls, in the United States. It is 515 ft. long, 80 ft. wide, and 18 ft. deep. At Birkenhead a head of 13 ft. gives a velocity to the issuing water which destroyed the outlet works. The most absolute solidity of construction would be required for any works intended to raise large vessels, by any method, to a height of 100 ft. or 120 ft. above sea-level, and it is evident, from Mr. Slaven's remarks, that the question of what he calls temporary locks is one as yet unstudied.

We do not, on the present occasion, intend to do more than call attention to the evidence unconsciously given by Mr. Slaven. It is a highly significant fact that at a time when M. de Lesseps, having already incurred a liability to shareholders and bondholders of 1,347,552,500 francs, is applying to the French Government to aid him to raise 600,000,000 francs more, having done little more than a quarter of the work estimated, and that of the easiest kind, he has ceased to supply his shareholders with the accounts hitherto given of the monthly progress. For July last 911,000 cubic mètres are returned as excavated during the month, and for August 1,052,000, instead of the 3,000,000 a month promised. But the *Bulletin* has given no monthly summary since August, although there are not a few notices of the stoppage of many of the "chantiers" by continued rain. But to find that Mr. Slaven, with every wish to say what is most favourable to the enterprise, can only point to the execution of three-fifths of the easiest part of the easiest section of the work in seven years is highly instructive. No let or hindrance has opposed this part of the work with the exception of the one grave difficulty of the climate. Dredgers can work under continued rain, which excavators can not do. Too much has been said as to the progress of the Panama Canal in the future tense. We should like to have a little more information in the present tense.

SIR ROBERT RAWLINSON, C.B.

THE long-expected retirement of Sir Robert Rawlinson from official life is at last about to take place. At the ripe age of seventy-six, Sir Robert thinks it is time to rest from the toils of office. He has held his appointment of Chief Engineering Inspector to the Local Government Board ever since that Board was formed, and his name is synonymous with the progress of sanitary engineering, of which he may be said to be the father.

Born in 1810, at Bristol, Robert Rawlinson, whose father was a builder and an engineer, commenced his career at an early period under the paternal eyes. At the age of twenty he was sent to Jesse Hartley, the famous dock engineer, and remained with him at the Liverpool Docks for five years. He was then engaged for four years under Robert Stephenson on the London and Birmingham Railway, now part of the North-Western, and here he was resident engineer on the important cutting near Blisworth. He underpinned up-

wards of a mile in length of rock resting on clay, in a cutting 55 ft. deep, and executed the whole of the masonry, bridges, culverts, &c., of the heaviest cutting on the line. When, in 1840, the line was completed, he obtained the appointment of Assistant Surveyor to the Corporation of Liverpool, which post he retained for three years. He then was recommended by Jesse Hartley for the post of Engineer to the Bridgewater Canal Trust, in which he remained for four years, during which time most important works in connexion with the feeding of the canal, and its improved working, were brought about by him.

His next public work was in connexion with the building of St. George's Hall, Liverpool, of which Mr. Elmes was the architect. In 1847 Mr. Elmes became a victim to consumption, and was compelled to leave this country for a milder climate. Before leaving he confided the completion of his great work to Sir Robert. The late Sir William Tite supposed that young Rawlinson held but a subordinate position, and was clerk of the works, but this Sir Robert has refuted. He has satisfactorily proved that Mr. William Hughes was clerk of the works, and that he himself really took the place of Mr. Elmes, in regard at least to the constructive portion of the work.

The water-supply of Liverpool next engaged his attention, and he submitted a scheme for supplying the town from Bala Lake and the River Dee. This scheme, the wisdom of which has been justified by events,—for Liverpool has had recently to adopt something very similar in taking water from the River Severn,—was considered too vast for the wants of Liverpool, and was therefore rejected.

When, in 1848, the Public Health Act was passed, Mr. Rawlinson was appointed first Engineering Inspector, and ever since that date his career has been inseparably bound up with the progress of sanitary engineering. He inspected a great number of towns, commencing with Dover, and completely reorganised the drainage and sanitation of the principal provincial towns of this country. He retained his appointment for seven years, at the end of which he found his private practice increasing to so enormous an extent that he retired from office and devoted himself to the more lucrative occupation of consulting engineer. He was consulted for upwards of fifty towns, and devised schemes of water-supply for Birmingham and Wolverhampton. The city of Carlisle owes its sewerage system to him, which he completed at a cost of less than 23,000*l*., though other engineers had estimated the cost at as much as 70,000*l*. and 80,000*l*. During this period he constructed upwards of a hundred miles of sewers.

In 1855 Mr. Rawlinson was appointed Engineering Commissioner to the Sanitary Commission that was sent out to the seat of war in the Crimea. The operations of that Commission are matter of history, and it will suffice to say that whereas before the arrival of the Commission the death-rate among the troops had reached the alarming figures of 420 per 1,000 per annum, when they left it had declined to but little over 2 per cent. Here Rawlinson was wounded whilst in the pursuit of his duties, and he had to return home to be cured; but his services were not forgotten, and when a Permanent Army Sanitary Commission was formed in 1860, he obtained a seat on it which he has always retained.

Mr. Rawlinson's next great work was the administration of the fund raised for the Lancashire Cotton Famine. He carried out public works in ninety-three Lancashire towns, involving an expenditure of 1,650,000*l*., every penny of which has been refunded. The administrative charges did not amount to more than 3s. 6d. per cent. The cotton operatives were saved from starvation and pauperism, and the Lancashire towns were drained and paved. It is estimated that the streets and roads thus improved represent an area of 800 acres, and a length of 400 miles. For his distinguished services to his country, Mr. Rawlinson was made a C.B. Subsequently, on the recommendation of Mr. Gladstone, he received the honour of knighthood in 1883.

Sir Robert Rawlinson has served on numerous Commissions, and was Chairman of the Rivers Pollution Commissions of 1865 and 1868, and of the Royal Sanitary Commission of Dublin of 1879. He is a Vice-President of the Society of Arts, and a mmeber of Council of the Institution of Civil Engineers. Sir Robert is the author of numerous scientific reports and papers, and of "Suggestions" for the use of local surveyors and sanitary engineers, which have been accepted as authoritative both in England and abroad. His work on "Chimney Shafts" is also well known to the readers of the *Builder*.

THE ROOF OF THE NATIONAL AGRICULTURAL HALL, KENSINGTON.*

The erection of a National Agricultural Hall in the west end of London was the original conception of the late Major Burnaby, M.P. for Leicestershire, who, taking great interest in the military tournaments which had been so successfully carried out at the Agricultural Hall, Islington, naturally desired to see these displays executed, not only in an area of larger dimensions, but in a situation more readily approached than that in the north of London. The position chosen was a site formerly occupied by a market garden upon the western side of the Addison-road Station of the West Metropolitan Railway, to and from which station frequent trains run in connexion with the suburban lines of the metropolis and all the principal main railways of the kingdom. The site occupies 6¼ acres of ground and commands three good entrances, a railway entrance upon the east side, a carriage entrance approached from the Hammersmith-road upon the south side, and a goods entrance approached at the north-west corner from Blyth-lane. (See Plan in the *Builder* of October 3, 1885.)

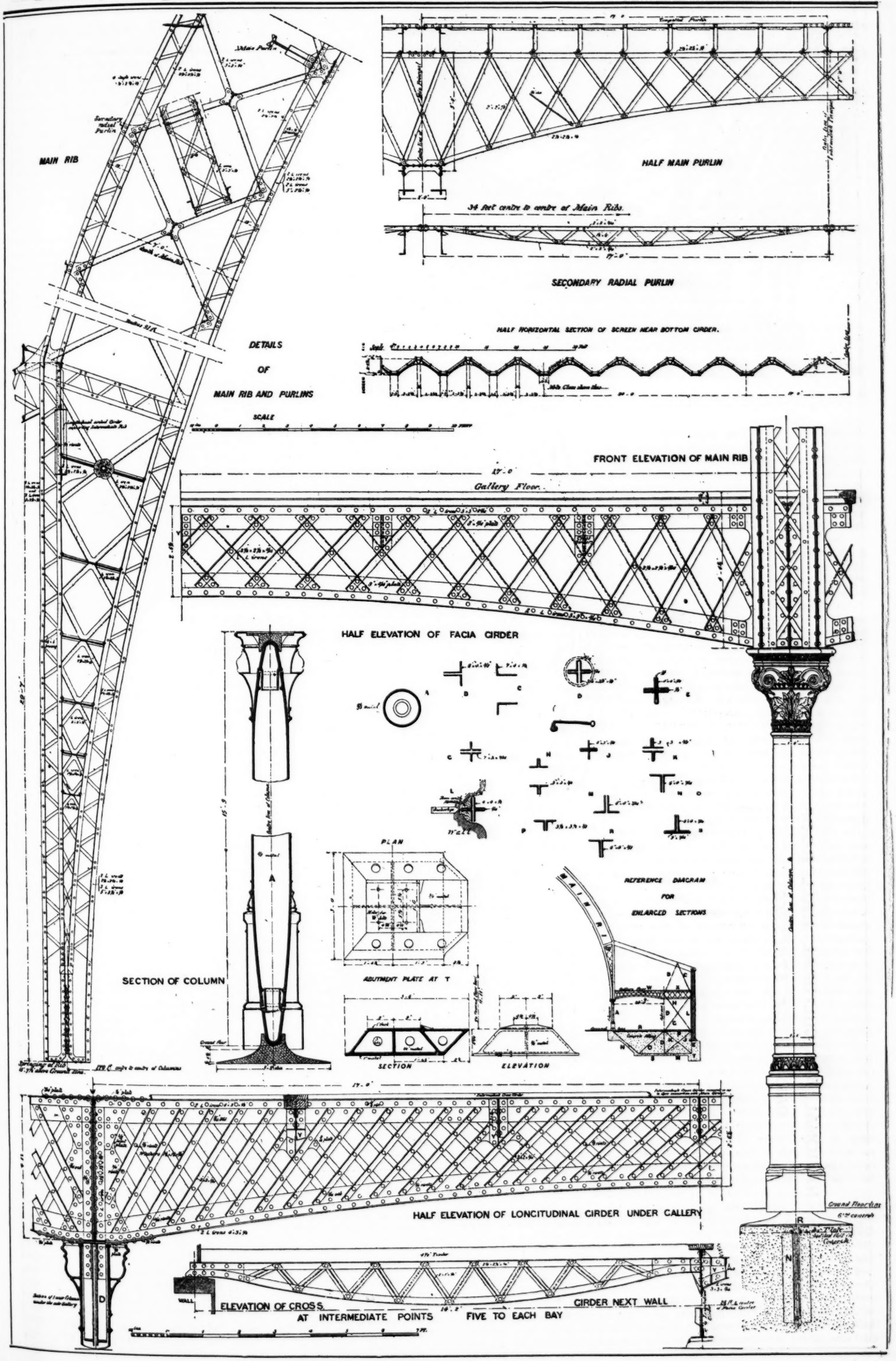
As soon as a company was agreed to be formed, the late firm of Messrs. Henry E. Coe & Stephen Robinson were selected to be the architects. They consulted the author with Mr. Max am Ende, M. Inst. C.E., as to the best form of structure to be complete in itself for covering as much unimpeded space as practicable, and the capital of the company was fixed at 200,000*l*. Shortly afterwards a design in iron was ordered to be prepared by Messrs. Max am Ende and A. T. Walmisley, and it was agreed that they should be engaged as joint engineers to assist the architects in the preparation and carrying out of the ironwork contract. This design was illustrated in the *Builder*, dated October 3, 1885. The light appearance of the construction which has been adopted was attained not by any sacrifice of safety, but by adaptation of every detail to meet the various stresses found *by calculation* in order to avoid any unnecessary surplus material, and by a careful study of all the possible stresses resulting from equal and unequal loading, including the effects of wind pressure in varying directions. In bridge construction, where the various parts are perpetually exposed to a damp atmosphere, or in a railway station roof, constantly subject to the influence of the fumes from the locomotives, the use of webs and flange plates seems quite reasonable, but in a roof such as that now under consideration, where all the ironwork is under cover, and where such deteriorating influences are seldom at work, it was felt that an opportunity was presented for a greater development of the parts, and a design remarkable for an entire absence of long wide plates and webs was accepted in which the various parts of wrought-iron work are composed wholly of flat bars and angle irons riveted together, plates being only introduced where required for covers in the joints. This arrangement gives a light appearance, and is especially appropriate for wrought-iron construction (see illustration). The death of the chief promoter to the undertaking, Major Burnaby, M.P., and also of one of the architects, Mr. Robinson, caused some delay, but subsequently a contract for the erection of the whole building was let to Messrs. Edwin Lucas & Son, of Kensington, for 131,000*l*. (see the *Builder*, May 23, 1885, p. 748), the execution of the ironwork, amounting to about 1,200 tons, being sublet to Messrs. Handyside & Co., of Derby, and the glass and zinc work to Mr. T. W. Helliwell, of Brighouse, Yorkshire. Messrs. Franklin & Andrews were appointed the quantity surveyors. Shortly after a portion of the work was completed, the resignation of the architect, Mr. Henry E. Coe, on account of ill-health, and his death very soon afterwards, caused the course of events to become somewhat altered.

Mr. James Edmeston, F.R.I.B.A., was appointed architect to the National Agricultural Hall Company, and was entrusted with the execution of the work. Messrs. Handyside & Co.'s and Mr. T. W. Helliwell's contract were each transferred, so as to be held by them direct from the Company, Messrs. Lucas & Son being left to carry out the whole of the remaining building operations, which included Company's offices, refreshment-rooms, and a minor hall, the details for which were prepared by the architect, Mr. James Edmeston. The minor hall forms an annexe to the great hall, and it is intended to be used separately for smaller exhibitions or concerts. It is situated close to the north-east corner of the main building, and is very easy of access, being the nearest portion of the building to the booking-office upon the west side of the railway station. The railway entrance to the main building displays good architectural features. This elevation, designed by the late Mr. H. E. Coe, is of an Italian character, with a façade of brick and stone (see *Builder*, Oct. 3, 1885).

The Great Hall of the main building covers a rectangular space of over two acres and a half, being 440 ft. by 250 ft. between walls, and its erection was personally superintended by Mr. am Ende and by the author. The main ribs have a clear span of 170 ft., and are placed 34 ft. apart, forming eleven bays between the end screens. The clear height to the crown of the roof is about 100 ft. The main ribs are of box girder shape, 7 ft. deep and 2 ft. wide, the lattice construction adopted, enabling the material to be placed further away from the axial lines than is usual when plates are introduced. Although the soffit of each main rib is semicircular from a level of 15 ft. 9 in. above the ground, the central portion of the main rib itself springs from a higher level, and should, therefore, be properly described as a segmental rib. The open space under the curved roof amounts to 374 ft. by 170 ft., or nearly an acre and a half in the clear. This is surrounded by a gallery, 40 ft. wide upon the north, the west, and the south sides, and 26 ft. wide upon the east side. The gallery is covered by a lean-to roof, which abuts against the curved rib upon the north and south sides, and is attached to the horizontal member of the screens upon the east and west sides. Below the top of the roof over the side galleries the arched rib forms on each side an ornamental spandrel (see small view on p. 911), which rests upon a column, the resistance to the thrust being assisted by the lean-to roof over the gallery. The connexion between the main rafter of the side roof, and the arched rib is formed by a top plate, which practically acts as a hinged or spring joint, whereby the complication of a fixed connexion does not occur in the calculation of the stresses. The main rafters of the side roof are connected to a braced vertical frame of 14 ft. effective depth, and the thrust is thus conveyed down to a foundation girder 12 ft. deep, which is continued horizontally underground to carry the base of the columns supporting the main arched ribs. Thus the surrounding brickwork is not called upon to resist any portion of the thrust of the arched roof, as the side frames through which the gallery floor passes form a self-contained system of ironwork in which the thrust is ultimately conveyed to the ground. The chief points of support to these side frames are formed in each case of two main concrete blocks, one placed at the lower outside corner under the outside wall, a cast-iron bed-plate being built into this concrete block to receive the side frame, and the other concrete block placed under the base of the pivoted column. The foundation girder of the side frame is buried with its top flange laid 6 in. below the floor level, and is embedded in a mass of concrete to protect it against the effects of dampness.

The mechanical couple required at the springing of the rib to maintain its rigidity is supplied by the main rafters and the transverse floor girders of the side galleries. The upward pressure below the column is neutralised by the whole weight of the structure resting upon the column, which is, under all circumstances, sufficient to resist the upturning action of the abutment when the wing is blowing upon the opposite side. If thid result were not obtained, some anchorage would have been required to resist the upturnins

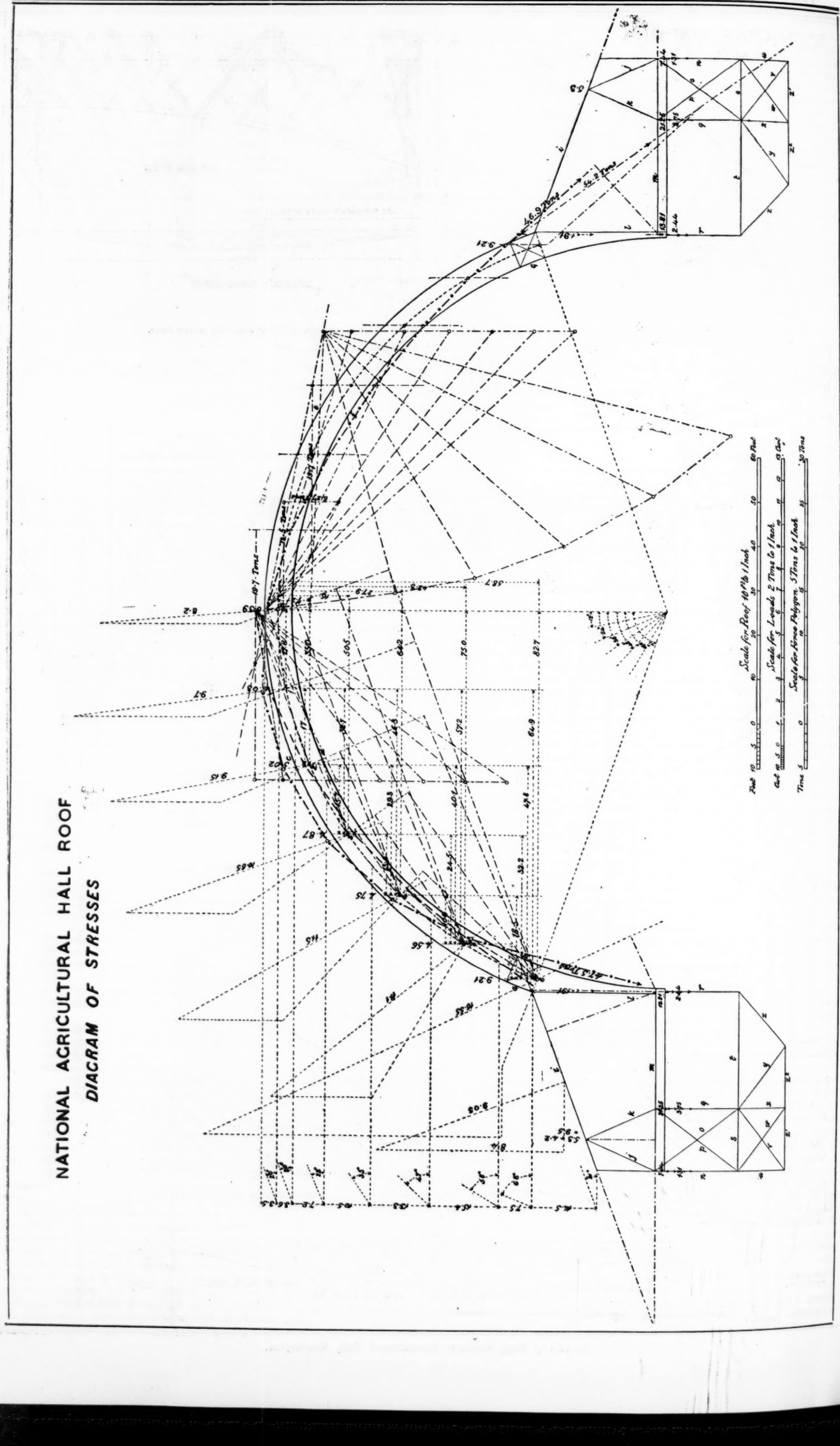
* By Mr. Arthur T. Walmisley, M. Inst. C.E., being a paper read before the Civil and Mechanical Engineers' Society, at the Town Hall, Westminster, December 21, 1887, Mr. R. E. Middleton, M.Inst.C.E., President, in the chair.



Details of Roof, National Agricultural Hall, Kensington.

NATIONAL AGRICULTURAL HALL ROOF

DIAGRAM OF STRESSES


Scale for Roof 10 Lbs 1 Inch
Scale for Loads 2 Tons to 1 Inch
Scale for Force Polygon 5 Tons to 1 Inch
Feet 10 5 0
Feet 20 10 0
Feet 40 20 0
Feet 60 30 0
Cwt 10 5 0
Cwt 20 10 0
Cwt 30 15 0
Cwt 40 20 0
Tons 5 0
Tons 10 0
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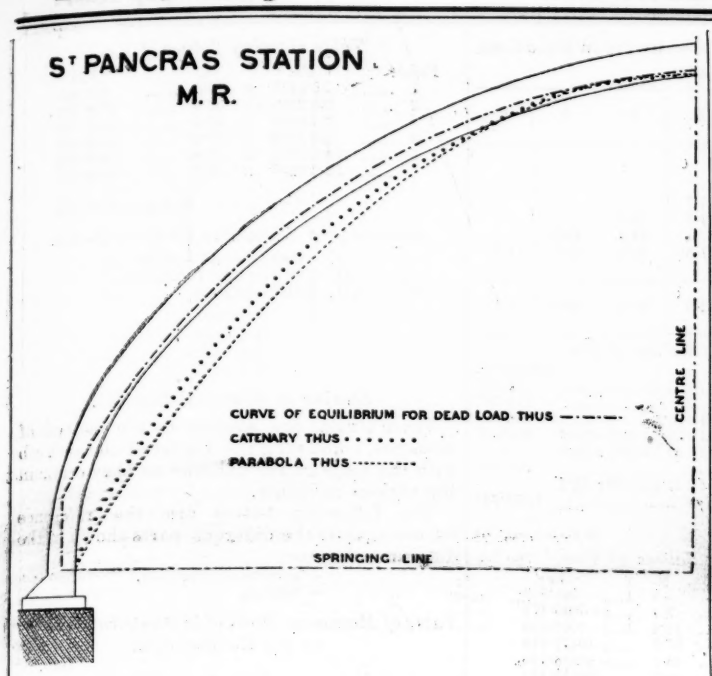
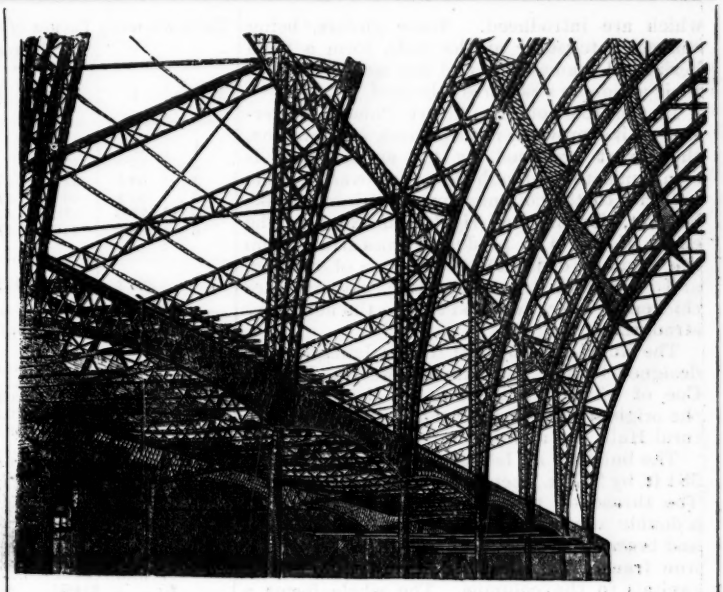
Tons 30 0





National Agricultural Hall, Kensington.

force. Upon the author's assumption that the wind may be taken as acting normally, the maximum and minimum loads upon the pivoted column under the springing of the rib amount to 82½ tons and 49½ tons respectively. These columns are made of cast iron, and are constructed with a true ball-and-socket bearing at each end, which is concealed at the top by a foliated capital, and at the base by a casting which gives the appearance of an ordinary column.

By the introduction of the pivoted connexion, the strains which these columns resist are always vertical, and therefore definite. This would not be the case if the connexions were made rigid, as the fascia girders supporting the inner sides of the gallery are continuous girders, and would be constantly exerting excessive bending moments of various intensity in the columns, to say nothing of the indeterminate stresses which might be caused by the ribs. These fascia gallery girders have curved bottom flanges and continuous girders of the same type are placed vertically immediately below the point of junction of the side roof with the curved rib and *radially* throughout the curved rib at distances, 18 ft. 6 in., to act as main purlins. These purlins have been made continuous from screen to screen, not only to provide longitudinal resistance to the lateral pressure produced by the wind upon either screen rib, but also to avoid the necessity of strengthening the flanges of the purlins in the centre between the main ribs, and for appearance's sake to avoid great differences in the size of the diagonal bars forming the web. Another point of detail is the simultaneous application in the arched roof of radial and tangential purlins. Between each main rib is fixed an intermediate rib supported by the main purlins, dividing the bays into longitudinal distances of 17 ft. Under the ventilator surmounting the curved roof these intermediate ribs are made of additional strength, and the secondary purlins to which the covering is attached are introduced at about 6 ft. apart. They are fixed in a *radial* direction between the main purlins, and are placed in a *tangential* direction over them, thus not only supporting the weight, but also resisting any tendency of the glass and zinc covering to gravitate downwards over the curve of the roof. Between the ventilator and the side roof a steel-framed ladder of light construction is introduced in place of the ordinary gantries upon either side. These ladders travel upon a rail fixed parallel to the gutter at the springing of the rib, and run upon a girder at the junction with the ventilator roof.

The screens which close the semicircular ends of the arched roof consist of a vertical ridge-and-furrow construction, whereby the appearance of the usual heavy horizontal members in a gable screen is avoided. This construction offers great resistance to wind pressure, combined with a minimum amount of weight and material. The framework of this part of the structure is made of mild steel.

The covering follows the zigzag-shaped surface resembling corrugations, and presenting a near approach to a folded curtain screen.

The wind bracing has not been indiscriminately introduced throughout, as is so often done, but has been confined to the side roofs and the two end bays of the curved roof, the nine intermediate bays of the curved roof where it is not required being free.

The inner longitudinal girders to the gallery floor, at a distance of about 14 ft. from the outside walls upon the north and south sides, are continuous girders. The cast-iron columns upon which they rest contain the wrought-iron member of the braced framework. This member, which is formed of four angle-irons in a cruciform section, takes the tension produced by the thrust of the roof, and is jointed by cover angle-irons to permit the body of the column being slipped over it during erection. The caps and bases to these columns were made as split castings, *i.e.*, castings made very thin (about 1-16th inch in vertical lines) upon opposite sides, but of the proper thickness all round, so as to be easily divided into two upon these vertical lines when required to be fixed, and so as to provide a true curved surface at the joints. They are then joined by a plate let into the surface and connected by tap screws. This vertical member is thus constructed to act both as a strut and a tie. The intermediate floor girders and the intermediate purlins in the arched roof have their bottom flange constructed in a fish-belly shape, with the object principally of preserving a uniform section for the diagonal bars. At the east and west ends the columns are also placed 34 ft. apart, the same as those upon the north and south sides, dividing the span of 170 ft. under the screens into five bays. The travelling stage employed and designed by Messrs. Handyside & Co. for erecting the ironwork was illustrated in the *Builder*, May 29, 1886, p. 775. It included a substantial staircase and top platform, made 62 ft. wide, so as to overhang 14 ft. in a longitudinal direction upon each side of two adjacent main ribs (34 ft. centres) during erection, Compared with other roofs of large span, the ironwork is both a little wider and a little higher than St. Pancras Station. The outline of the main rib of this roof differs both from the form of the catenary and the parabola, to which curves it has sometimes been erroneously compared. The main ribs in this roof are firmly bolted down to massive abutments by four 3-inch bolts at the foot of each principal. Owing to the spread given to the feet of the ribs and the holding-down bolts being placed at a distance apart of 11 ft. 5 in., they act with considerable leverage and prevent the stresses in the rib causing any change of angle at the feet of the rib. The theoretical effect of this arrangement is similar to that produced by making girders continuous over piers, and reduces the stresses in the rib to about half the amount that would exist if the ribs were hinged or unsecured at the abutments. By this means a great saving of metal is effected, which is an important consideration in roofs of large spans, as the load increases in a much greater ratio than the span. In addition to the massive abutments there are also horizontal girders running across the station below the level of the rails to carry the platforms, the underneath portions being let for cellars; and with a view to ensure perfect stability, a wrought-iron tie runs below these girders, consisting of a ⅝ in. plate riveted on to the bottom flange of the wrought-iron main floor girders.

The roofs over St. Enoch's Station, Glasgow, 198 ft. span, and the Central Station, Manchester, 210 ft. span, are similar in type to the roof over St. Pancras Station, London (240 ft. span). The anchorage plate in the St. Enoch's Station is made to spread principally upon the inside of the main ribs, whereas in St. Pancras Station it spreads principally upon the outside.

In the Central Station, Manchester, it spreads both upon the outside and the inside of the main rib. In St. Enoch's Station the feet of the main ribs are constructed of cast iron. These are bolted down to massive foundations by four anchor bolts, 2¼ in. diameter, with a distance between the bolts of 19 ft. 7 in. The thrust of the rib in the Central Station, Manchester, is resisted in a similar manner, but here the distance between the anchor bolts is 17 ft. 6 in. It will be seen from the above description that the only difference with regard to the way in which the thrust is resisted is, that in the case of the St. Pancras rib (M.R.) the abutments are aided by a tie across the floor connecting the feet of the main ribs, but as the horizontal thrust of this roof must be practically taken by the heavy brick piers acting as abutments, and secured by the anchor bolts, the theoretical conditions in each roof are the same. In the form adopted for the National Agricultural Hall roof, as previously remarked, no anchor bolts are necessary. In the main roof over the Crystal Palace building at Sydenham (104 ft. span), although the depth and section of the rib are such that the arches throw a very small horizontal thrust upon their supporting structure, the whole force of the wind has still to be resisted, and to effect this the columns are thoroughly braced together by cast-iron girders and wrought-iron tie-rods. The same method has been adopted in the roof over the Royal Aquarium, Westminster, which has a span of 35 ft. 6 in., the only difference be in that the diagonal bracing is not spread out so much, comparatively speaking, as at the Crystal Palace.

In the roof over the Derby Market Hall, which has a span of 43 ft. 3 in., it might be supposed upon first entering the building that the thrust of the roof was communicated to the walls through the side galleries, whereas the upper parts of the gallery framing, with some additional parts, are constructed to form horizontal girders, the inner flange being supplied by the cast-iron gutter, while the outer flange and bracing are supplied by the additional wrought-iron plates and bars

which are introduced. These girders, being connected together at the ends, form a rigid horizontal framework, and are as effectual in their action as ties across the roof.

In the roof of the Albert Palace, Battersea, unlike previous roofs of arch construction, the thrust produced by the arched roof is communicated through the roof over the side galleries to the columns by a cast-iron fan-like bracket, forming a rigid connexion. The effect of this is to produce a cross strain upon the columns, owing to the absence of bracing, and therefore the supporting columns are thickened where required to give the necessary strength.

The Royal Agricultural Hall at Islington was designed by the late firm of Messrs. Peck & Coe, of which firm the late Mr. Henry E. Coe, the original architect for the National Agricultural Hall, was a member.

The building at Islington covers a space of 384 ft. by 217 ft., occupying less than two acres. The thrust of the main span is taken by a double row of columns placed 11 ft. apart, and braced together in couples by strong cast-iron framework, assisted by brackets above the capitals to the columns. The whole forms a wide base, and is firmly bolted down to brickwork foundations.

In the Coventry Market Hall, designed by the late firm of Messrs. Coe & Robinson, the thrust is taken by the side brick arches assisted by the base of columns being bolted down at the foundation. The space here occupied by the side arches is economised in the National Agricultural Hall building by the form of the main rib, these being carried down vertically (see illustration) below the junction of the side roof, to the supporting column, so that no portion of this part of the main rib occupies space in the vertical area of the gallery. The impediment produced by the diagonal bracing in the gallery of the Crystal Palace, Sydenham, is also avoided in the National Agricultural Hall, the only portion causing obstruction in the gallery of the latter building being limited to 14 ft. nearest the outside wall, the remaining 26 ft. of floor space nearest the gallery railing being quite free from all obstruction. The building was opened Christmas, 1886.

The cost of the iron and steel work erected complete has been from 26*l.* to 27*l.* per square of 100 ft. superficial area. The building has, since its completion, been styled "Olympia" for sake of brevity, a title particularly appropriate to the Exhibition which the managers of the Paris Circus Company are now conducting.

The author has subjoined a calculation of the stresses in the main ribs, assuming the wind to blow horizontally and to act normally upon the curved surface with a wind pressure of 30 lb. per foot super. The Metropolitan Board of Works have no fixed rule upon this point. The unit pressure they adopt depends upon the height and position of the building under consideration, and the method which is best to adopt in estimating the amount of pressure is also much open to dispute. Further experiments need to be made before a satisfactory conclusion can be arrived at.

CALCULATIONS ACCOMPANYING DIAGRAM OF STRESSES.

The equations have been deduced from the following works:—"Civil Engineering," by Professor Rankine; "Die Lehre von der Elasticität und Festigkeit," by Winkler; "Stresses of Rigid Arches," by W. Bell, M.Inst.C.E.; and "The Theory of Arches," by Max am Ende, M.Inst.C.E., have been employed in the following consideration of the calculation of stresses in the main principal:—

$$\text{I. } \Sigma F - Fx + 2H(b+y) = 0.$$
$$\text{II. } \Sigma F xy - 2Hy(b+y) = 0.$$
$$\text{III. } \Sigma F xz - 2Vz^2 = 0.$$

Σ=Sum.
F=Force at the various points.
x=Leverages of forces.
H=Horizontal thrust at the crown.
b=Vertical distance of H from the crown.
y=Vertical distances of points round which moments are taken from crown.
z=Horizontal distances of points round which moments are taken from crown.
v=Vertical shearing force at the crown.

Table showing Values of y and y^2.

y		y^2
1·8	.....	3·24
7·2	.....	51·84
16·0	.....	256·00
27·9	.....	778·41
42·3	.....	1789·29
58·7	.....	3445·69
153·9	.....	6324·47

Table showing Values of x occurring in Equations.

WEIGHTS.

Points.	1	2	3	4	5	6
1	17·8					
2	35·0	17·0				
3	50·5	32·7	15·7			
4	64·2	46·3	29·3	13·6		
5	75·0	57·2	40·1	24·5	10·9	
6	82·7	64·9	47·8	32·2	18·5	7·7
	325·2	218·1	132·9	70·3	29·4	7·7

Table showing Values of Fx.

Point.	Products.
1. $3·2 \times 17·8$	56·960
2. $3·2 \times 35·0 + 6·03 \times 17$	214·510
3. $3·2 \times 50·5 + 6·03 \times 32·7 + 5·02 \times 15·7$	438·595
4. $3·2 \times 64·2 + 6·03 \times 46·3 + 5·02 \times 29·3 + 4·87 \times 13·6$	697·947
5. $3·2 \times 75·0 + 6·03 \times 57·2 + 5·02 \times 40·1 + 4·87 \times 24·5 + 4·75 \times 10·9$	957·308
6. $3·2 \times 87·2 + 6·03 \times 64·9 + 5·02 \times 47·8 + 4·87 \times 32·2 + 4·75 \times 18·5 + 4·56 \times 7·7 =$	1,175·744
E Fx =	3,541·064

Tables showing Values of Fxy.

Point.	Fx.	y.	Fxy.
1	56·91	1·8	102·528
2	214·51	7·2	1544·472
3	437·595	16·0	7001·520
4	697·947	27·9	19472·718
5	957·308	42·3	40494·124
6	1175·744	58·7	69016·170
E Fxy =			137631·532

Statement of Equations for Dead Load.

Load being symmetrical.
Equations I. and II. only will be required.

I.—$2 \times 3541 + 2 \times 6H\dot{b} + 2H154 = 0$
II.—$2 \times 137631 - 2H\dot{b}154 - 2H6324 = 0$

Solving $H = -19·7$
$\dot{b} = +4·3$

Table of Wind Pressures.

Unit pressure 30 lb. per square foot.

Points.	Area of inclined surface.	Angle of inclined surface.	Normal pressure per sq. ft.	Total normal pressure in lbs.	Total normal pressure in tons.
0	315	20°	13·60	4277	1·91
1	629	20°	13·60	8554	3 82
2	629	23°	15·44	9711	4 33
3	629	35°	22 38	14077	6·29
4	629	47°	27 50	17297	7·72
5	629	50°	28·56	17964	8·02
6	315	68°	30·00	9450	4·22
Side roof..	1428	21°	14·20	20277	9·05

Table showing Values of z and z^2.

Point.	z.	z^2.
1	17·8	316·84
2	35·0	1225·00
3	50·5	2550·25
4	64·2	4121·64
5	75·0	5625·00
6	82·7	6839·29
Totals.	325·2	20678·02

Table showing value of x for Wind Forces.

FORCES.

Points.	1	2	3	4	5	6
1	17·25					
2	35·25	17·8				
3	52·75	35·7	17·80			
4	69·75	52·5	35·00	18·00		
5	85·00	67·7	50·75	35·20	18·00	
6	97·75	80·5	64·30	50·80	35·00	17·90
Totals.	357·75	254·2	167·85	104·00	53·00	17·90

Table showing values of Fx.

Points.	Products.
1. $1·91 \times 17·25$	32·9475
2. $1·91 \times 35·25 + 3·82 \times 17·8$	135·3235
3. $1·91 \times 52·75 + 3·82 \times 35·7 + 4·33 \times 17·8$	314·2005
4. $1·91 \times 69·75 + 3·82 \times 52·5 + 4·33 \times 35·0 + 6·29 \times 18·00$	598·5425
5. $1·91 \times 85·00 + 3·82 \times 67·7 + 4·33 \times 50·75 + 6·29 \times 35·20 + 7·72 \times 18·00$	1001·0795
6. $1·91 \times 97·75 + 3·82 \times 80·5 + 4·33 \times 64·30 + 6·29 \times 50·80 + 7·72 \times 35·00 + 8·02 \times 17·90 =$	1505·9215
E Fx =	3588·0150

Table showing values of Fxy.

Point	Fx		y		Fxy
1	32·9475	×	1·8	.....	59·305
2	135,3235	×	7·2	.....	974·329
3	314·2005	×	16·0	.....	5027·208
4	598·5425	×	27·9	.....	14699·335
5	1001·0795	×	42·3	.....	42345·662
6	1505·9215	×	58·7	.....	88397·591
E Fxy =					151503·430

Table showing Values of Fxz.

Point.	Fx.		z.		Fxz.
1	32·9475	×	17·8	.....	586·465
2	135·3235	×	35·0	.....	4726·323
3	314·2005	×	50·5	.....	15867·125
4	598·5425	×	64·2	.....	38426·428
5	1001·0795	×	75·0	.....	75080 962
6	1505·9215	×	82·7	.....	124539 707
E Fxz =					259227·010

Statement of Equations for Wind Forces.

I. $-3588 + 2 \times 6H\dot{b} + 2H154 = 0$
II. $151503 - 2H\dot{b}154 - 2H6324 = 0$
III. $259227 - 2V20678 = 0$

Solving.

$H = +12·5$
$\dot{b} = -1·75$
$V = +6·27$

Strains in Abutment Framing.

These strains are worked by the method of moments, combining the thrust of the arch rib with the loads on the galleries as they occur in the various members.

The following letters are the reference letters against the different parts shown in the diagram.

\+ denotes compression.
— tension.

Table of Maximum Strains in Abutment Framing on the Weather Side.

	Tons.
i	− 10·28
j	− 8·40
k	+ 14·08
l direct stress, curved flange + 33·18 / l from bending moment „ + 77·70	= +110·88
l direct stress, straight flange + 33·18 / l from bending moment „ − 77·70	− 44·52
m	+ 13·88
n	− 6·49
o	+ 7·05
q	+ 33·00
u	− 0·88
v	+ 82·66
w	+ 1·53
y	+ ·76
x	− ·71
z^1	− 1·13
z^2	− 1.13

Maximum Strains in Abutment Framing on the Lee Side.

	Tons.
i	+37·27
j	+53·10
k	−33·30
l direct stress, curved flange + 16·55 / l bending moment „ „ − 20·20	= − 3·65
l direct stress in straight flange + 16·55 / l bending moment „ „ + 20·20	= +36·75
m	− 3·6
n	+99·60
o	−56·97
q	−27·20
t	−27·60
u	+99·60
V	−33·06
v	+49·60
y	−36·80
x	+37·70
z^1	+59·80
z^2	+59·80

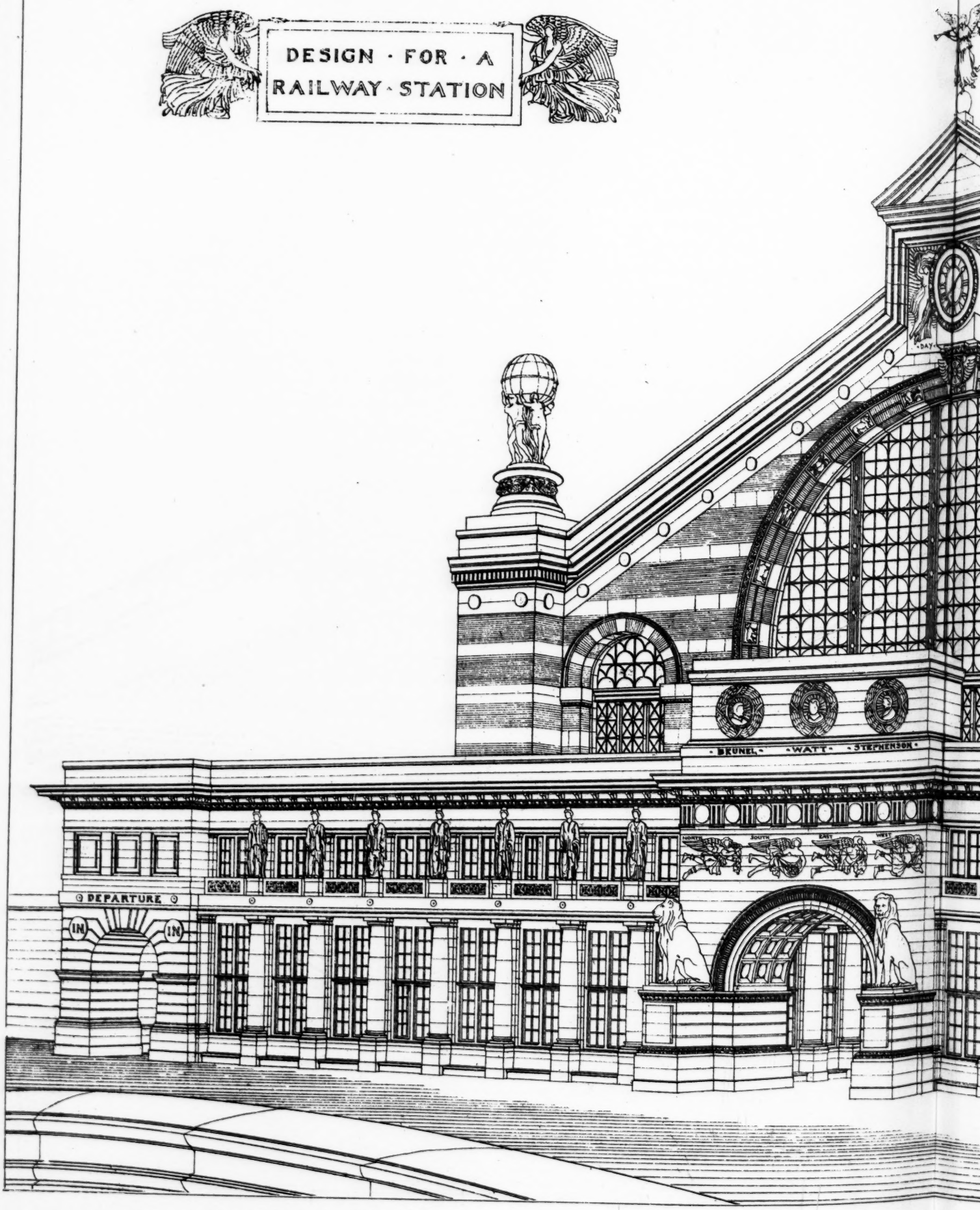
The greatest stress in the flange of the arch rib occurs where the curve of equilibrium is farthest removed from the neutral line of the rib by taking moments round the flanges.

Stress in flange at a = −15·83
„ „ b = +63·33
Stress in one set of diagonals between a and b = 6·5 tons, each set being in duplicate, stress in each bar = −3·10

A vote of thanks to the author, proposed by Mr. James B. Walton, seconded by Mr. B. Haughton, was carried unanimously.

New Market for Carlisle.—The foundation-stone of the new market here was laid on Tuesday, the 20th inst., by the Mayor of Carlisle, Mr. W. J. R. Crowder, J.P. The external walls are of red stone, from quarries at Annan, Newbiggin, and Wetheral. The glazed bricks for lining the inside of the market are supplied by Messrs. Craig, of Kilmarnock. The concrete flooring is by Mr. Omerod, of Carlisle; the iron roofing by Messrs. Robertson, of Workington; builders' work by Messrs. H. & R. H. Hodgson, of Workington; and carpenters' and joiners' work by Messrs. W. & H. Davidson, of Carlisle. Mr. Henry Creswell Charlton is the clerk of works. The architects are Messrs. Cawston & Graham, of London; and the buildings are to cost 30,000*l.* Externally the building is of rock-faced ashlar up to the plinth, with quoins, cornices, and window jambs tooled; the general walling is of random snecked rubble. There are six principal entrances, with circular columns and carved capitals. An arcade entrance from the principal street, and a Jubilee tower, 160 ft. high, at the north-west corner, are features of the building. There are terraces on two sides, supported on stone columns.

DESIGN · FOR · A RAILWAY · STATION



DESIGN FOR A RAILWAY STATION.—E

PERSPECTIVE VIEW

Awarded the Royal Academy Gold Medal and Travelling Stndentship, 1887.

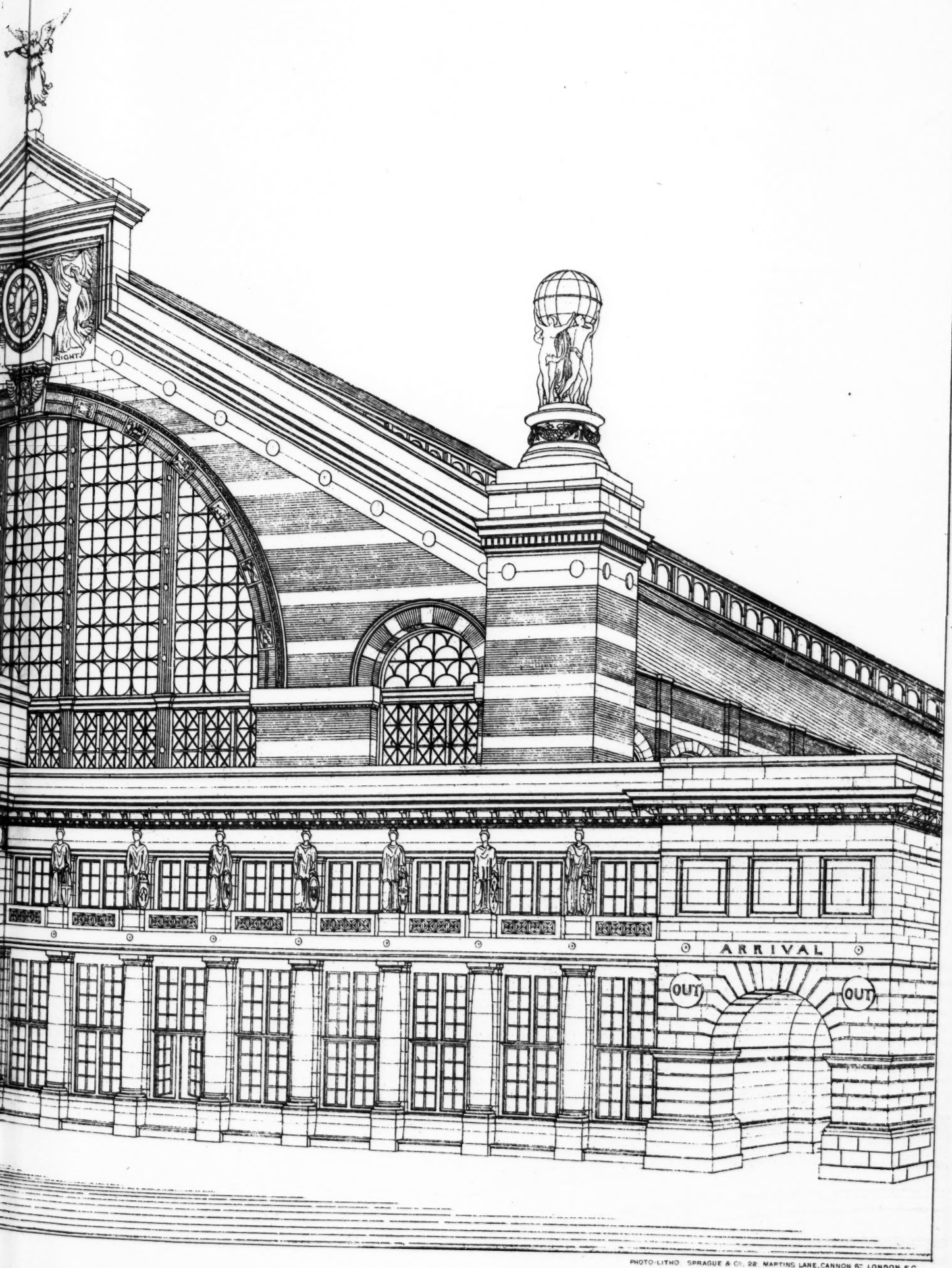
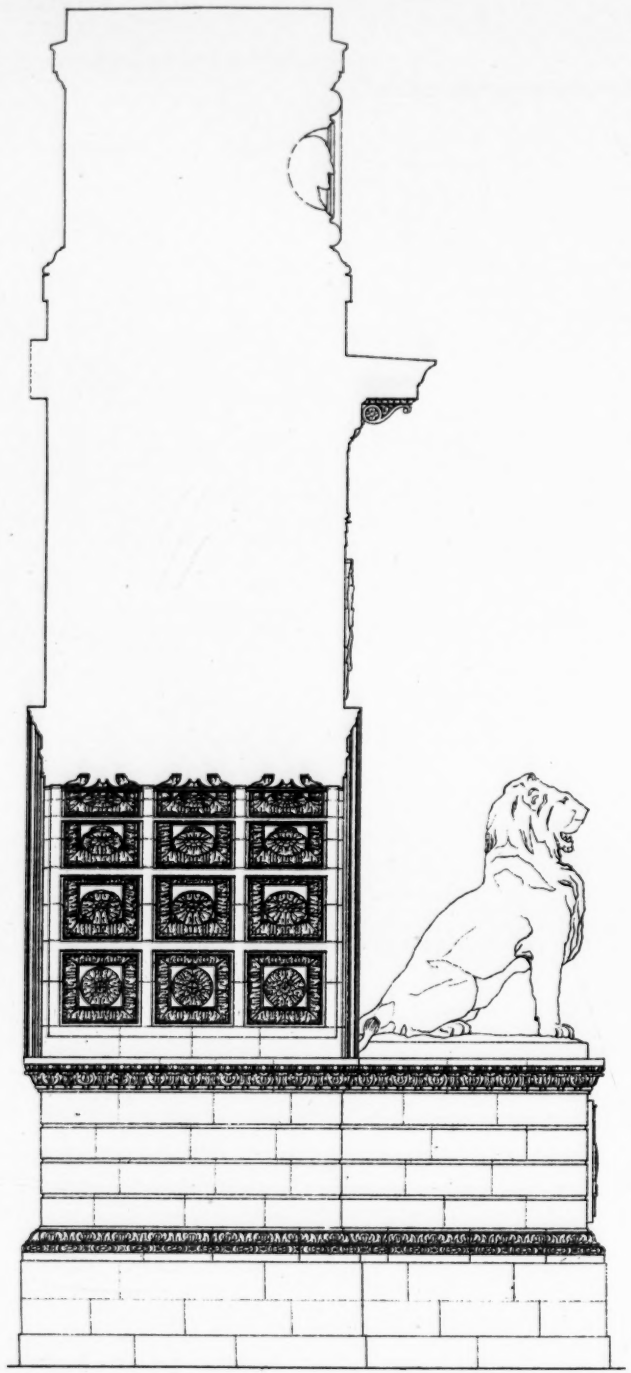
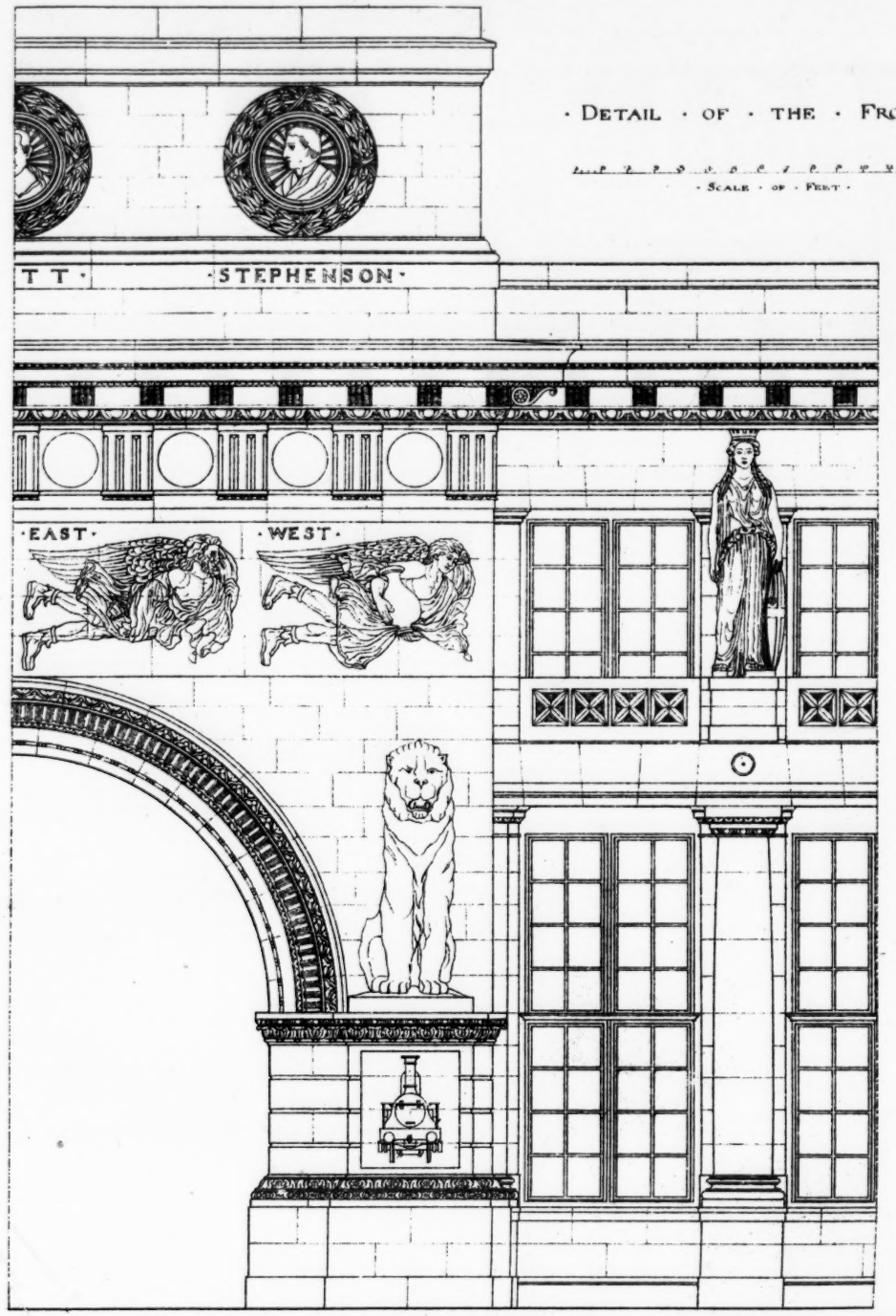


PHOTO-LITHO SPRAGUE & Co. 22 MARTINS LANE, CANNON ST. LONDON, E.C.

ION.—By Mr. R. Weir Schultz.

E VIEW.



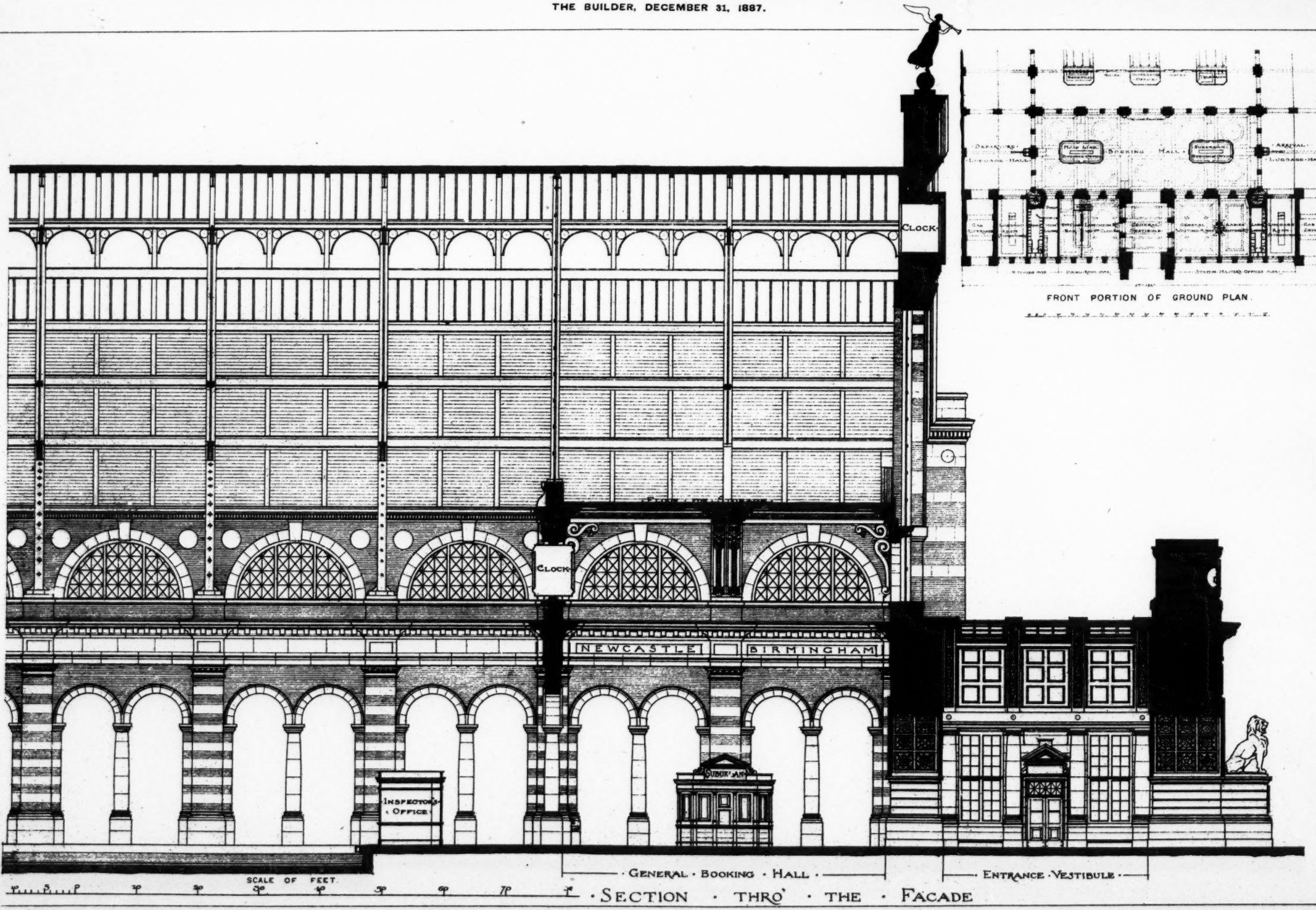


DESIGN FOR A RAILWAY STATION.—By Mr. R. Weir Schultz.

DETAILS.

Awarded the Royal Academy Gold Medal and Travelling Studentship, 1887.

PHOTO-LITHO. SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.



FRONT PORTION OF GROUND PLAN.

· SECTION · THRO' · THE · FACADE

DESIGN FOR A RAILWAY STATION.—By Mr. R. Weir Schultz.

SECTION & PLAN.

Awarded the Royal Academy Gold Medal and Travelling Studentship, 1887.

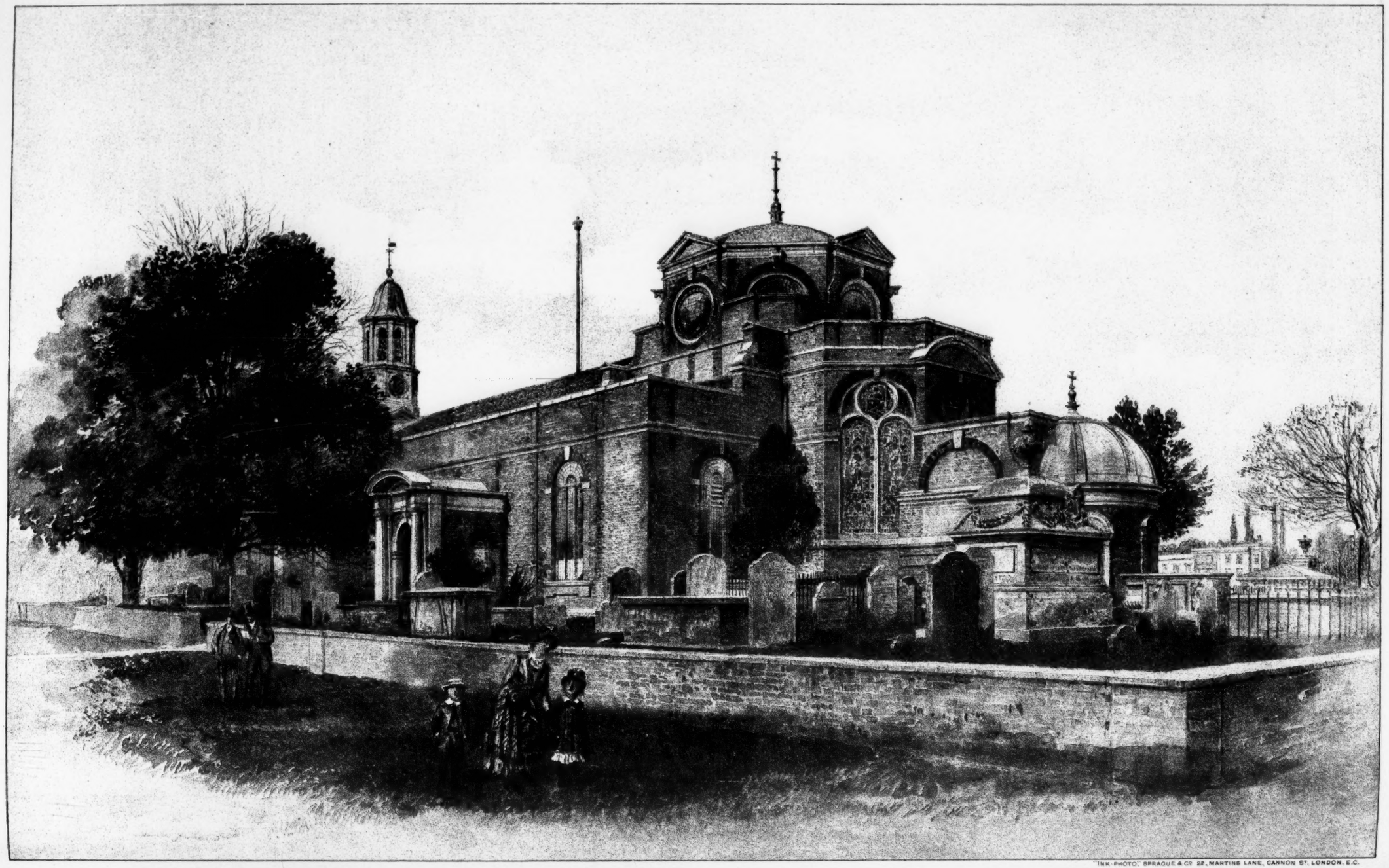
PHOTO-LITHO. SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

"SUMMER." DESIGN FOR DECORATIO

Awarded the Royal Academy Prize for Decorative Painting, 1887.

PHOTO-LITHO. SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

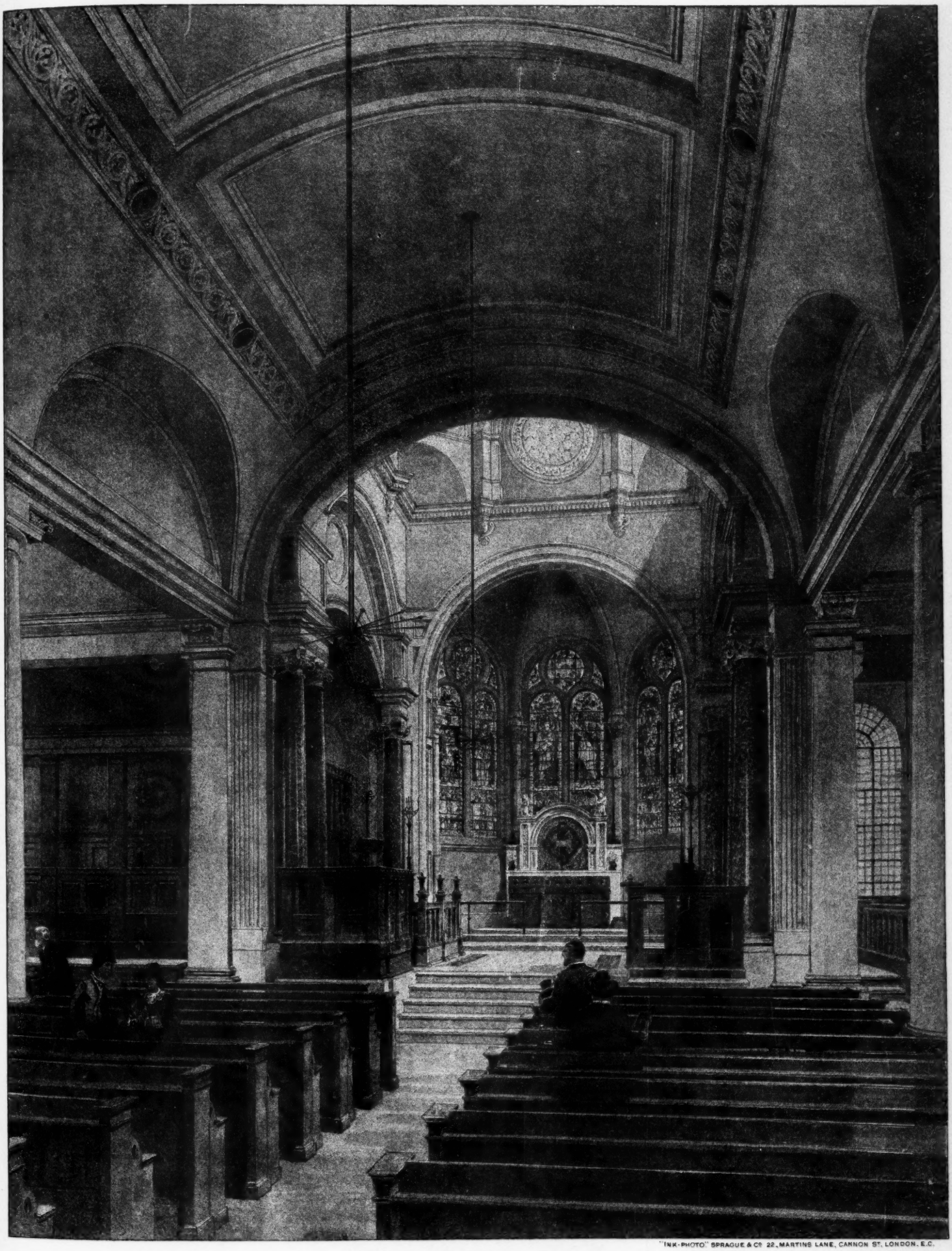
DECORATION.—By Mr. E. R. Stephens.



"INK-PHOTO." SPRAGUE & Co 22, MARTINS LANE, CANNON ST, LONDON, E.C.

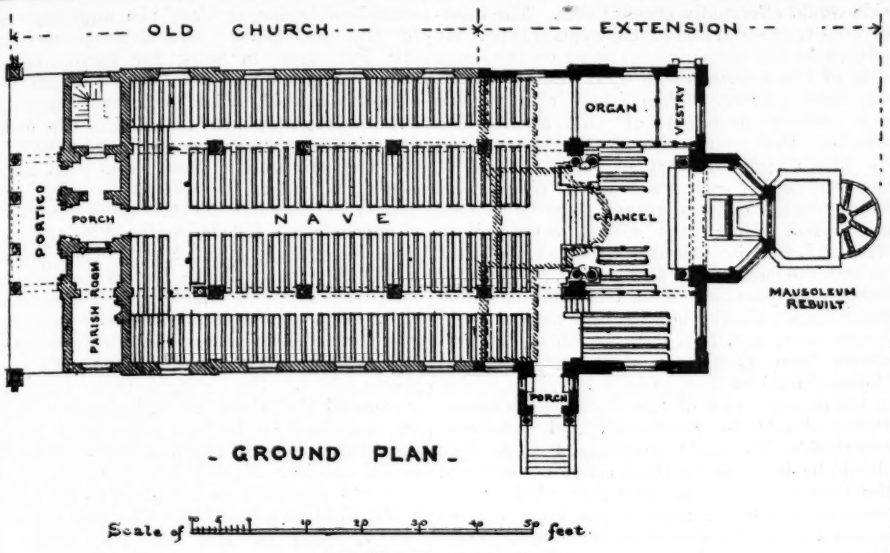
ENLARGEMENT OF KEW CHURCH.—Mr. Henry Stock, F.R.I.B.A., Architect.

EXTERIOR LOOKING WEST.



"INK-PHOTO" SPRAGUE & Co 22, MARTINS LANE, CANNON ST. LONDON, E.C.

ENLARGEMENT OF KEW CHURCH.—Mr. Henry Stock, F.R.I.B.A., Architect.
INTERIOR LOOKING EAST.



Kew Church, as Enlarged.

Illustrations.

DESIGN FOR A RAILWAY STATION.

WE give the perspective, detail, and a portion of the plan and section of this design by Mr. R. Weir Schultz, which obtained the Academy Gold Medal for architectural design. We commented on the design in our general remarks on the Academy students' competition designs, pages 834-5, *ante*.

"SUMMER": DESIGN FOR THE DECORATION OF A PUBLIC BUILDING.

THIS is the design by Mr. E. R. Stephens which obtained the Royal Academy prize of 40*l.* for the best design for a decorative painting for a public building in the recent students' competition. The illustration is from an outline drawing made for the purpose by the author, the original drawing being retained by the Royal Academy for the present. It is, we understand, to be executed in some suitable position, not decided on yet.

KEW CHURCH, SURREY.

IT having been determined to enlarge the parish church of St. Ann, Kew, by a prolongation eastward, a difficult problem had to be solved; the existing style (if it had any) had to be preserved. It was stipulated that the mausoleum of the Cambridge Royal Family should, in any enlargement, occupy in the new work the same relative position as it did in the old; this mausoleum, with its terminal semi-dome, with an organ-chamber above it completely blocking the east end. Moreover, the church was covered with a peculiar roof, spanning its whole width, which rendered an eastern finish very unpromising; and internally the tower was ceiled with a very low and gloomy segmentally-arched vault, springing from the cornice above the Tuscan colonnade.

The work has comprised the extension of the nave and aisles by one bay, a new south porch, the erection of a chancel and aisles, with a central apse. The mausoleum was re-erected with its dome eastward of this, and is entered from a doorway behind the reredos, and under the east window, which is lighted in part from an area formed by screen walls which connect the dome with the body of the apse. In erecting the chancel and aisles advantage was taken of the height of the churchyard above the floor of the church, and their floor is level with this.

Over the chancel, which is square on plan, is a low circular concrete dome, carried on an octagon clearstory, pierced with circular and semicircular openings on its cardinal and angle faces, and this clearstory both stopped the roof and gave altitude within.

The construction of the old nave roof permitting it, the ceiling was cut down and a new panelled one constructed at as great an elevation as practicable, following in its curves the lines of the chancel arch, and in this semicircular groins were cut over each bay of the colonnade.

The church was reseated throughout and warmed with a circulating system of hot water, the total cost of the works being 5,167*l.*

Mr. H. Stock, 9, Denman-street, London Bridge, was the architect; Messrs. Goddard & Sons, of Farnham, were the builders; and Messrs. W. Baily & Son, of Gracechurch-street, executed the warming work.

The church was re-opened on July, 1884. The drawings from which the illustrations are taken were in this year's Royal Academy exhibition.

THE INSTITUTE OF BUILDERS.

DISCUSSION OF SANITARY MATTERS.

AT the meeting of this Institute held on the 15th inst., Mr. Robt. J. Waller in the chair, in the absence of Mr. J. Howard Colls, the President,

The Secretary having read the minutes of the last meeting,

Mr. John T. Chappell read a paper on "Sanitary Matters." He began by saying that the subject of his paper, "Sanitary Matters," was one which he was sure was not only of individual but of universal interest and importance; and to deal with it adequately was a most difficult task. What he proposed to do was to give them his own opinions upon the question, based upon experience and careful observation. He did not think it necessary to dilate at length on the various methods in vogue for the disposal of human excreta amongst the ancients, or, indeed, of those of any period, until we approached very nearly the present age. The first departure from the most primitive customs was, he supposed, what was termed, not very euphoniously, the "privy system," and a very offensive system it was, with absolutely no recommendations on the score of sanitation, but many horrible disadvantages and dangers. By far the most important division of his subject was, however, "the sewer, or water-carriage system," and, assuming that an adequate supply of water was available, he thought it would be generally admitted that it was the system best adapted for our large cities and towns, and was almost universally accepted as the best mode of disposing of what we included in the term "sewage matter." It was of the first importance that the sewers should be of proper design, and the tubular or egg-shaped sewer which was most generally adopted seemed to answer its purposes very well. In constructing these sewers materials should be used as far as possible impervious to moisture, and with the internal surface very smooth, and the whole absolutely watertight. As an example of this kind of work he could not do better than refer to the very excellent specimens carried out under the direction of the Metropolitan Board of Works. It was important that the gradients of sewers should be sufficiently sharp to ensure the rapid flow of the sewage, and that the sewers should be laid at a sufficient depth to enable an adequate fall to be given to house-drains in connecting them with the sewers. This latter point, he feared, had not in the past been sufficiently considered,—doubtless, in some instances, owing to the expense attending it, but with the result that it had been necessary to connect the house-drains too near the bottom of the sewer,—in his opinion a most serious drawback, as it often results in the house-drains being water-logged. He was strongly of opinion that in the construction of new sewers there were now but few civil engineers who (wherever practicable) would not provide for their being of sufficient depth to admit of the house-drains being connected much nearer, if not actually at the very top, of the sewer. Personally he would prefer the latter course, as it would prevent what was, he felt sure, too commonly the case, imperfect connexion of the house-drains, by means of which the smooth and even surface of the sewer was entirely destroyed at such points, rough and uneven projections, &c., which were a fruitful source of obstruction, being often caused. These might, in his opinion, be entirely avoided by the introduction in the crown of the sewer of key or junction blocks constructed with removable discs, so as to admit of the various sizes of house and other branch drains being connected without any cutting or making good other than the joint between the pipe and its connexion with the key or junction block. With regard to this suggestion he considered the facilities it would give for ventilation of even greater importance. Another important point in the construction of sewers was the provision for adequate and periodical flushing, and of inlets for inspection. Turning to the subject of house-drainage, he thought great advance had been made in the last few years, so much so that the arrangements that had been in existence for the past ten years without alteration would generally be found not only defective, but detrimental to health, if not absolutely dangerous. This state of things was principally caused by the absence of an intercepting chamber between the house-drains and the main sewers, and of adequate provision for the inlet of fresh air through the house-drain or for the ventilation of the same. In consequence of this and the multiplication of traps, syphonage of the latter was a common occurrence, with the result that vapours and gases escaped into the house,—a condition of things which, he believed, might without much difficulty be entirely obviated. Proceeding to deal with what he considered the desirable approach to perfection, he would first refer to the sewers, from which, unless proper ventilation, flushing, &c., were provided, the greatest source of danger probably arose. Some of his remarks might not meet with the approval of those who advocated the closing of street gratings and supplying only "vent" pipes, thereby destroying all chance of true ventilation. It was perfectly true that in many cases such gratings were nothing but outlets for the emission of foul vapours and gases, in consequence of no other means of escape being provided for them. What appeared necessary to him, therefore, was to prevent the accumulation of such vapours and gases, and not the expenditure of our energies in the attempt to find a solution for the dispersal of that which he was strongly of opinion might entirely be avoided. This, he said, could be attained not by closing up the street gratings, but by materially increasing their number and providing escape for the vitiated air. He would suggest that for this purpose outlets of not less than 9 in. clear internal diameter should be provided on the top of the sewers, from which a ventilating-pipe should be continued of a like diameter, until it reached a vertical pipe, or column, when it might be reduced to 6 in., and carried to a height of not less than 15 ft. from the surface of the ground. He did not know any reason why the lamp-posts should not be utilised for the purposes of these vertical pipes. This would necessitate the substitution of other lamp-posts for those now in use, and the size would have to be increased; but from the bottom of the pipe upwards it might be reduced to 4 in. internal diameter. A special lamp would, of course, be required, and he would recommend its being of an octagonal pattern, the top being covered with an opal reflector. This lamp should have a clear space of about 5½ in. internal diameter continued through it from top to bottom, so as to admit of the cast-iron lamp-post,—at this point say 5 in. over all internal diameter,—passing through it. The inside portion of the lamp should be enclosed by a reflector. The lamp could then be slipped over the top of the column down to its resting-place about the usual length, and be supported by a moulding

or other ornament. An ornamental cap of louvre pattern could then be placed at the top of the column, the whole being of an ornamental or artistic design. The reflecting power of the lamps would be very much increased in this way, and an escape from the heated air being provided around the top of the lamps, the columns above it would also become heated, and thus increase the upward flow of the air in the shaft. Three burners would, of course, be necessary in each lamp to prevent shadows, but as the light would be increased by the reflectors the burners need not be so large as those at present in use. Fresh-air inlets should be provided in the roads and be placed as nearly as possible midway between the outlets. He would now make a suggestion that he feared would not meet with approval in the same direction. It was that these outlets should be supplemented by utilising that portion of the house-drain between the intercepting trap and the sewer. On the sewer side of the intercepting trap he would take a branch pipe of not less than 4 in. internal diameter, and continue it up the house to the highest point, and of course as far as possible from all windows and chimneys. It was important in connexion with this method of ventilation that the area of the intakes should be at least one-fourth in excess of the aggregate area of the outlets. The levels of the inlet gratings being much lower than the outlets, and not subject to the friction caused by bends, &c., the greater atmospheric pressure at the intake point would insure a constant flow of fresh air through these apertures and up the outlets. While aware that on this point there was a considerable difference of opinion, he held that one pound of fact was worth a hundred-weight of opinion, and he was prepared to prove that, under the circumstances indicated, these surface gratings would be found to be neither more nor less than intakes of fresh air and not outlets from the sewer. Returning to the question of house sanitation, he thought they must all admit that the best known mode of securing this much-desired object was that the house-drains should be thoroughly disconnected from the sewer, and that on the house side of the intercepting trap there should be a fresh-air inlet, so as to produce a current of air through the house-drains, with an outlet at the top of the soil-pipe, and any other ventilating-pipes that the length and position of the drains might necessitate, particularly at all dead ends. Mr. Chappell then proceeded to discuss at some length the employment of traps, and said that none should be placed between the fresh-air inlet and the ventilating outlet, thereby insuring a thorough current of air. They should only be introduced to the various apparati, and so ventilated as to prevent the possibility of syphonage. Dealing with the position, size, and description of house-drains, he would assume that they were thoroughly disconnected from the sewer. He might take it for granted that the drains would be constructed of a proper size and have a proper fall. He was in favour a large size, nothing less than 6 in., and oftentimes 7 in. or 8 in. By employing pipes of a large size they got the advantage of providing a free passage for the air, or, at least, a much more perfect passage. In the case of terraced houses the pipes would generally have to pass under the house; but in detached and semi-detached houses, the pipes should pass outside. The drains from the sewer and intercepting traps should be of stoneware pipe, but pipes passing under the house might preferably be of cast iron. All the branches used should be of the Y-pattern. On the sewer side of the trap, and on the top of the drain, in the position previously indicated, he would provide a junction for ventilation. Assuming that the connexion with the sewer was on top, that would form a continuous ventilating-pipe, of course carried up to the highest point of the house. It was doubly necessary that there should be such a ventilating pipe where the connexion of the house-drains was made near the bottom, as in such a case the vapours and gases in that portion of the house-drain between the sewer and the intercepting trap and the area, were put under pressure in that portion of the drain, and unless there were means of ventilation, these gases and vapours would be forced through the intercepting trap, and pass through the remuinder of the house-drains, and not, as was too often thought, escape by the fresh-air inlet. The atmospheric pressure at this point would, of course, drive such vapours through the house. A ventilating pipe on the sewer side would effectually prevent this. The intercepting trap should be of the syphon type. He advocated the fresh-air inlet being on the house side of the syphon quite open and level with the area paving. This could also receive the surface drainage of the area. The size of this inlet should be determined by the aggregate area of the outlets of the soil-pipes and ventilating pipes, and should, in his opinion, exceed them by at least one-fourth. This inlet should communicate with an inspection chamber, all of which should be on the house side of the syphon, and as near thereto as possible. This chamber, he would recommend, should not be less than 3 ft. in length, and, say, 1 ft. 6 in. in width. Branch drains from rain-water pipes and basement closets should be brought in at the sides, whilst at the opposite end of the chamber the house-drains should be continued, and, wherever practicable, he would recommend that they should be 9 in. above the level of the entry to the intercepting trap. The channels from the chamber should be narrow and deep, and so insure a better flushing of the intercepting trap. All pipes should be laid with a true and regular fall, most cerefully jointed in Portland cement, and bedded and covered in concrete. As far as practicable soil-pipes should be outside the house. Closets on the basement might be of of the wash-out construction if outside the house, but whenever inside should be preferably of the valve pattern. The valve box should be provided with two connexions, one to receive an inlet ventilating-pipe 1¼ in. diameter, continued through the outer face of the wall, and there increased to not less than 2½ in. At the opposite side of the valve-box should be a connexion to receive a 1¼ in. outlet, the same to be continued through the wall in like manner as the former, but of the same size, thus forming an outlet, and ensuring a current of air, thereby preventing any smell from gases passing through the pan or valve, if out of order from any cause. Baths, sinks (except in the scullery), lavatories, and washing-troughs should all be provided with P-traps and inspection caps of adequate size, and fitted as close under each apparatus as possible. No D-traps should be used. None of the traps should connect with the soil-pipe, but open into a vertical waste-pipe of ample size, which should he properly ventilated, and be open at the bottom, and empty itself over a gully grating. For the scullery sink a fat-trap should be furnished. It might be objected that by leaving the waste-pipe open it would be liable to be frozen up, but he thought this objection only applied in colder climates than our own, or where, as in the northern parts of the kingdom severe frosts were of more frequent occurrence. In such cases the pipe might be fitted to the drains in the same way as the soil-pipe, but if that were done it was absolutely necessary not only to continue the waste-pipe up as a ventilator, but that from the top or crown of every trap there should be also a ventilating-pipe from that point connected with the main waste (such connexions always having an upward tendency, or serious consequences might result). He thought that if ever the suggestions he had made were carried out they would have habitable houses, as far as sanitation was concerned. With regard to the constant service water supply,—and no one would think of having an intermittent supply if he could obtain a constant one,—the rising main should terminate with a ball-valve over the cisterns for supplying the closets, flushing-tanks, &c. Branches should be made from the constant-service rising main to all sinks and baths or any other necessary draw-off tap, so as to obtain a supply of pure water. To prevent waste of water each cistern should of course have an overflow pipe near the top of the tank, passing through the nearest outer wall and there emptying, and so give warning that some attention was necessary. Having given some further details, Mr. Chappell, referring to his remark that a pound of fact was worth a hundredweight of opinion, instanced a large building of his own, planned and arranged by himself, and in which there were about forty-three closets, twelve baths, and about forty sinks, with lavatories, &c. The main drain was 9 in. diameter, with various-sized branches. There were several stacks of soil-pipes, all continued up to the top as ventilators, and the fresh-air inlet was a cast-iron grating (in the centre of a large yard), taking the surface water, the open space in which was considerably larger than the aggregate area of the soil pipes; and although the building had been in work for something like three years, and had been tested at all times and seasons, still, under no circumstances whatever had it ever been found that the current passed upwards, nor any smell perceived from the fresh-air inlet. Now, from what he had stated, it might be thought a very simple matter to carry out the sanitary arrangements of any building, but he ventured to think that even the most skilled experts often failed in laying down their plans; for very considerable difficulties arose in the details, the neglecting of any one of which might destroy the whole principle, and thereby, instead of insuring perfect sanitary arrangements, have quite an opposite effect. He thought these facts fully warranted the views he had advanced, and if the explanations he had attempted to give were found to be of any practical assistance he would consider himself amply repaid for the time and attention he had given to the subject.

Mr. Titmass asked if Mr. Chappell advocated the trapping of the soil-pipe under the bottom?

Mr. Chappell said by no means.

Mr. Titmass went on to say that the grease-trap was one of the chief difficulties, and was a very great bugbear in connexion with the sanitation of dwelling-houses.

Mr. Chappell said he fully agreed with that. He thought a good deal of the difficulty might be got over by a proper arrangement. The scullery sinks should discharge over a grease-trap, in which should be fitted a removable bucket to act as a strainer to collect the grease, which would be cooled by the surrounding water in the trap, and could be periodically removed. Some similar arrangement might possibly be made to fit under the scullery sink, and the grease removed and secured as an article of commerce.

Mr. Titmass said that the real difficulty of the plan advocated by Mr. Chappell was in getting the grease-traps cleaned. This was not a nice job for any one to undertake, and as it generally fell to the domestic servants of a house to undertake it, it was not surprising that they were inclined to neglect it. He looked upon it as an objectionable feature that the servants had the job of cleaning the trap, and thought if some plan could be devised to obviate this difficulty it would be very advantageous.

In reply to some further observations,

Mr. Chappell said that he had sometimes found the deposit of grease in a trap quite solid and as hard as a cricket ball. There were several points which rendered the subject a difficult one to deal with in a practically satisfactory way.

Mr. Titmass said that some sanitarians advocated traps at the bottom of soil-pipes as preventing sewer gas getting up the pipe and so into the house. He quite agreed that the drain pipes under the floors, and the soil-pipes, should be of iron. He thought there was a good deal in the suggestion made as to a ventilating lamp, and very much approved of the idea.

Mr. Chappell said that if the house-drains could be connected to the top of the sewer, and the ventilators made as he had indicated, he believed that sewer gas would be almost if not entirely prevented, but as we had to deal with things as we found them, we must do the best we could, and if intercepting traps, fresh-air inlets, and thorough ventilation of house-drains, were adopted, with the further safeguard of the ventilating pipes from the sewer side of the intercepting trap, each house would be practically safe. There would still, however, be the question of ventilating the sewers, but he felt confident that the day was not far distant when some solution of this difficulty would be found and its adoption insisted upon.

Mr. Scrivener thought it an objection to the proposed lamp-ventilators that they would not have the heat of the lamp during the daytime, when the lamp would, of course, be extinguished.

In reply to this Mr. Chappell thought that, from the fact of the intake ventilators being so much larger in area and at a lower level, the consequent greater atmospheric pressure would always ensure a current of air from the intakes.

Mr. Titmass said that the water companies provided one of the difficulties in the way of improvement by each insisting upon fittings to their own approval,—one wanting one kind and another another kind.

Mr. Chappell, on this point, said he thought that the sanitary registration of buildings, as had been proposed, was very well in its way, but what he thought of more importance was that a clear and definite system should be laid down, as was the case in New York, where, if a person wanted to connect the drainage of any building to the sewer, he had to apply to the Health Office and obtain a printed form of specification with blanks to be filled in by the architect or sanitary engineer, and submitted, with a plan, to the authorities for their approval. The work was then carried out under the superintendence of the architect or sanitary engineer, as the case might be, and when done it was inspected and certified by public inspectors under the control of the Health Office. This method of procedure came to his knowledge through a gentleman he had employed in his office within the last two years, who, on his return to America, finding how nearly his (Mr. Chappell's) views accorded with those in operation in New York, sent him copies of the documents in question as well as the regulations there enforced, and which seemed to him exceedingly well worked out. If we could have something similar in this country, it would not fail to prove of great advantage, and give valuable results, and he thought that in time we should come to this.

Mr. Titmass said "quite right" to that. The fact was they might take all possible pains to secure the best results in sanitary matters, but the actual work had to be done by others; and it was a too common occurrence that the result was unsatisfactory, and complaints were justly made of imperfections, drains clogged up, and so on.

Mr. Gough said that as a visitor he should like to say a few words from his point of view as an architect. He was pleased to hear builders condemning traps, and approved the suggested lamp-ventilator, but could not agree in using iron pipes for the purposes mentioned in the paper. In a house to which he had been called where iron pipes were used he found them so corroded as to be blocked up, and since then he had strongly condemned the use of such pipes. He wished he could hear such matters as these discussed at the Institute of Architects, but he was afraid some of his profession did not regard these matters with the interest they ought.*

Mr. Franklin suggested that the iron pipes might be lined with lead, and the danger from the corrosion of the iron pipe, pointed out by the last speaker, would thus be met.

Mr. Chappell said he did not propose iron piping alone, but iron piping with a thick coating of a suitable and proper composition, applied whilst the pipes were hot, which would effectually prevent oxidisation. He did not object to stoneware pipes provided that they were strongly bedded and the other necessary conditions carried out. The repairing of pipes lined with lead would be a very expensive matter.

A Member said he thought the grease-trap trouble was the greatest of all. It was not only the grease which got into it, but large quantities of other matters, tea leaves, &c.

After some further discussion, during which

Mr. Titmass said that the escape of water from baths, lavatories, &c., into drains was objectionable, as the soap in the water coagulated.

Mr. Chappell said he thought that bath and lavatory wastes should empty into the main waste, and be open at the top, whereby a through current of air would be obtained from the waste-pipe, the same being open at the top.

A vote of thanks was passed to Mr. Chappell for his paper, and

The Chairman announced that at their next meeting a paper would be read by Mr. F. J. Dove on "The Relation of the Architect's Profession to the Building Trade."

The proceedings then terminated.

Illustrations of Chetham Hospital.—The name of the author of the measured drawings of this building in our last should have been A. Needham Wilson, not J. Needham Wilson.

* We thought that these matters had been pretty well discussed at the Institute of Architects of late years. At any rate, we call to mind certain papers by Mr. E. C. Robins and others, including the winners of the Godwin Bursary.—ED.

THE INSTITUTION OF CIVIL ENGINEERS OF IRELAND.

WE take the following from the address recently delivered to this Institution by Mr. John Purser Griffith, President:—

Fifty-two years have passed since twenty engineers, practising in Ireland, met in the office of Public Works in the Custom House of this city, for the purpose of forming a Society of Civil Engineers. At their first meeting, on the 6th of August, 1835, Colonel John Fox Burgoyne was called to the chair, and in his opening address he pointed out the objects aimed at. I cannot do better than quote his own words:—

"You are well aware that in spite of the efforts of many able and eminent men, the profession has been at a low ebb in Ireland. Persons without education or skill have been frequently employed in operations of importance, and the consequence has been, as might have been anticipated, bad or injudicious works, wasteful or fruitless expenditure. It will be your effort to prevent the recurrence of these evils, and you are now adopting the measure best calculated to enable you to do so with effect, by organising a society for your own improvement." . . .

"Let us not overlook another essential benefit to be derived from such societies,—namely, that they encourage harmony and kindly feeling of fellowship among men of the same class, and mitigate dissensions."

The name adopted was "The Civil Engineers' Society of Ireland." It embraced in its member-class civil engineers, military engineers, and architects engaged as such in the United Kingdom, and among its first members were Colonel John Fox Burgoyne, John Radcliffe, Richard Griffith, and Charles Blacker Vignolles, names which have become household words among us. Most of the members were scattered through the country, and the meetings were only held half-yearly, at the Custom House. From 1837 to 1844 no reference appears of the proceedings in our minute-book. In the latter year a meeting was summoned to determine whether the Society should be continued or not. We rejoice to-day that there were three men connected with it who, in the face of much discouragement, resolved that it was "expedient to maintain the Institution, and to place it on such a basis as might render it permanently useful." This resolve was followed by the adoption of new rules for the management of the Society, and at the same time the name was changed to "The Institution of Civil Engineers of Ireland."

The progress of the Institution was now steady. The number of its members increased; its meetings were frequent; useful papers were read, giving rise to interesting discussions. Moreover, the publication of the Transactions was begun, and by this means the interest of members scattered throughout the country was increased. Under the new by-laws, architects were no longer eligible for election as members. We have not sufficient information in our minute-book to explain why this course was adopted. Suffice it to say that by common consent the professions have long been considered distinct in these countries, and each has its own distinctive Institutions. It is, therefore, from no disrespect that we do not now admit architects as such to our member-class. I think it will be of interest to try and clear up our ideas with respect to the distinguishing features of the professions of civil engineering and architecture, and to this end I would quote the opinions of some of the most eminent representatives of these professions. Mr. William Pole, F.R.S., the present honorary secretary of the Institution of Civil Engineers, points out that "according to the strict derivation of the term, an engineer is a person who sets his mental powers in action, in order to discover or devise some means of succeeding in a difficult task which he may have to perform."* Can any higher ideal be set before us than this combination of thought and action, of theory and practice?

With the great impulse given to hydraulic works in the eighteenth century throughout Europe, the need arose for competent men to carry out such works. "The architects found these new studies foreign to their own business, and were, moreover, already well occupied in their more legitimate employment. Hence a new class of practitioners became necessary, who should devote their attention to hydraulic constructions, with all their necessary mechanical arrangements; and with these soon became associated the erection of buildings of a massive and unartistic character. Thus the new class of men undertook to design not only river and hydraulic works, but roads, bridges, docks, harbours, mills, and machinery. Such a class required a new name. It was noticed that the kind of work undertaken by these practitioners was exactly analogous to that allotted to the 'engineers' of the military service, and the new profession adopted the same title, prefixing, however, the word 'civil,' to indicate that they were civilians, and so to distinguish them from their military brethren. Hence the origin of the present term, 'civil engineer.'"

The field in which the civil engineer labours is extensive and ever-increasing. In the words of Thomas Tredgold, "the scope and utility of civil engineering will be increased with every discovery in philosophy, and its resources with every invention of mechanical and chemical science."

Mr. James Fergusson, in his "History of Architecture," says,—

"Architecture is nothing more nor less than the Art of Ornamental and Ornamented Construction. The art of the civil engineer consists in selecting the best and most appropriate materials for the object he has in view, and using these in the most scientific manner, so as to secure an economical but satisfactory result. Where the engineer leaves off, the art of the architect begins. The structural features being correct, it is the province of the architect to add beauty to them."*

It will thus be seen that, although the works constructed by the civil engineer may be destitute of architectural ornament, yet no architectural work can be considered worthy of the name unless designed on sound structural principles. Architecture, therefore, seems to me a department of civil engineering, and I cannot but think it a matter for regret that it should have become a separate profession.

From its formation till the year 1853 the Institution of Civil Engineers of Ireland occupied rooms in the Custom House, kindly placed at its disposal by the Public Works Commissioners. We should never forget how much we owe to that body of public servants, and to our first President, who was their Chairman. In the year 1853 rooms were taken in 41, Upper Sackville-street, where the meetings were held, and to which the books and collection of models were transferred, in consequence of the rooms at the Custom House being required for the public service. The Sackville-street rooms had to be given up in 1861 for financial reasons, chiefly due to a falling off in members, and ever since we have been indebted to the Board of Trinity College for permission to hold our meetings within these walls. In 1873 it was decided to obtain rooms outside college, where members could have access to the books and papers belonging to the Institution. A Royal Charter was obtained in 1877, and in 1879 we moved to our present house in Dawson-street. The wisdom of the course adopted has been fully proved by the great additions made to the member and associate classes. Since 1873 the number of members has doubled, and that of associates quadrupled. Nor must we forget that this period corresponds with Mr. John Chaloner Smith's term of office as honorary secretary of this Institution. It is with sincere regret that we lose his services. None but those who worked with him can fully appreciate the loss which we sustain by his retirement from the most important official position in connexion with this Institution. The Smith premium will, we rejoice to think, perpetuate his name and serve to remind us of his ungrudging and unselfish service of fourteen years.

Having thus briefly sketched the history of the Institution, Mr. Griffith proceeded to discuss various topics of professional interest.

* This is a tolerably vague definition, however, and might apply equally to a great many other branches of human effort.—ED.

A New Small Pox Hospital.—The Metropolitan Asylums Board are about to erect a large small-pox hospital at Darenth, the intended outlay for the new building being 66,000*l.* It is to be erected on the Gore Farm Estate, which was purchased for the purpose in 1883, on which 24,000*l.* has already been spent, in addition to 11,000*l.* in the erection of a pier. It is intended for convalescent small-pox patients, and will provide 728 beds.

The Art-Union of London.—We have received from the Art-Union of London their plate for 1888. It is a reproduction in line-engraving, by Mr. Lumb Stocks, R.A., of Mr. J. B. Burgess, A.R.A.'s picture of "A Spanish Letter Writer."

* If this was meant to take construction out of the province of the architect, we need hardly say that we repudiate it *in toto*.—ED.

FIG 9

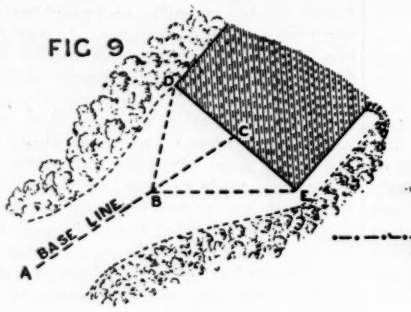


FIG 10

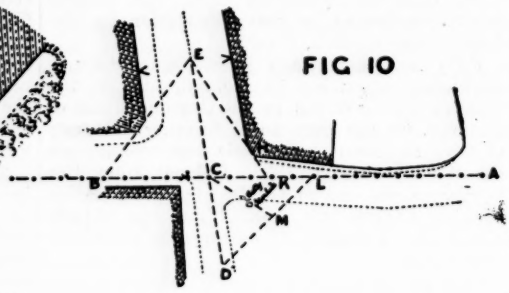


FIG 11

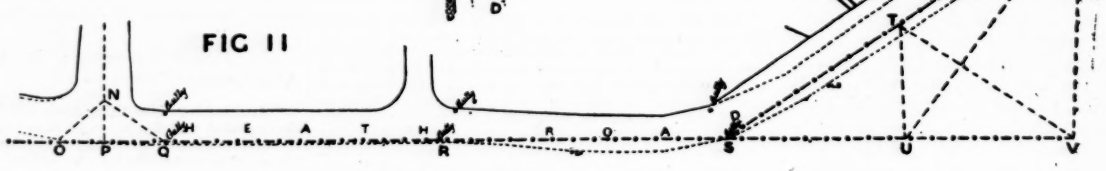
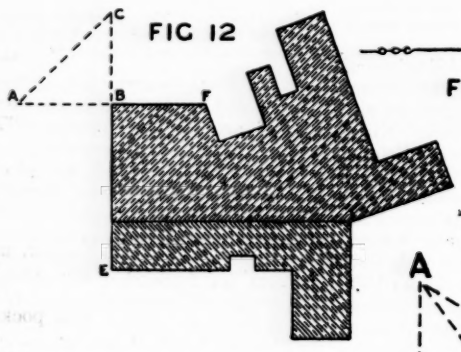


FIG 12



RIVER UNDER ONE CHAIN WIDE

FIG 13

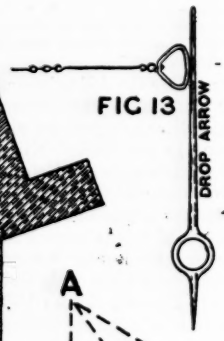


FIG 16

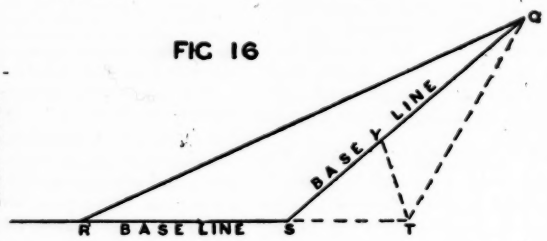
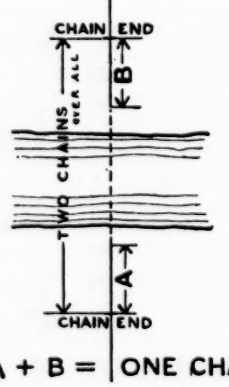


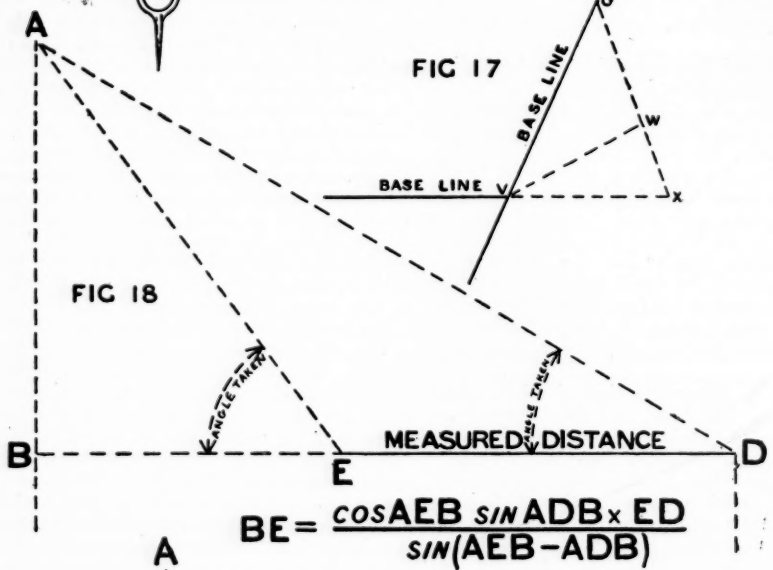
FIG 17

FIG 14



A + B = ONE CHAIN

FIG 18



$$BE = \frac{\cos AEB \sin ADB \times ED}{\sin(AEB - ADB)}$$

FIG 15

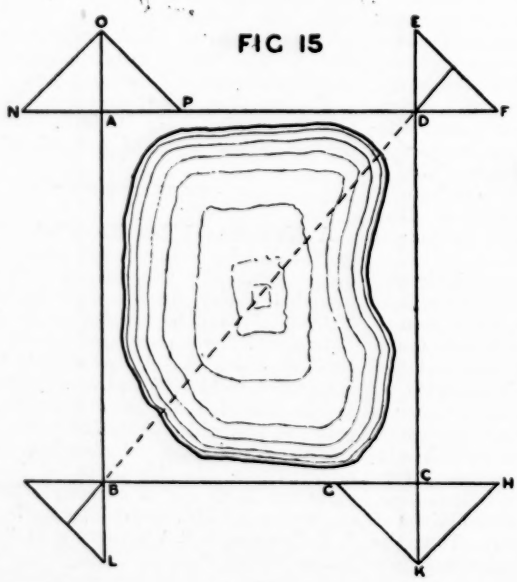
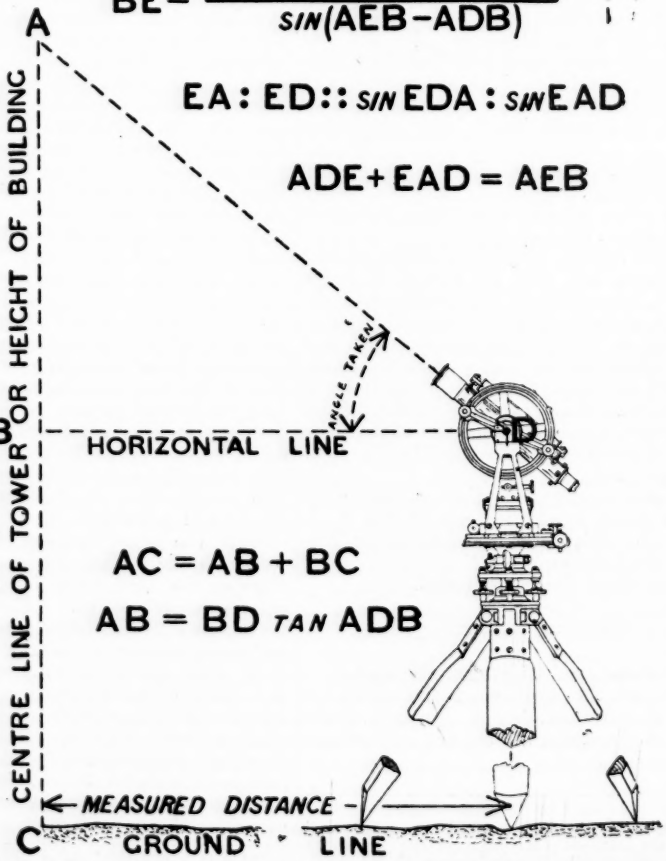


FIG 19



$$EA : ED :: \sin EDA : \sin EAD$$

$$ADE + EAD = AEB$$

$$AC = AB + BC$$

$$AB = BD \tan ADB$$

The Student's Column.

LAND SURVEYING AND LEVELLING.

XXVII.—DETERMINING DISTANCES.

FIG. 9 shows how the angle of a building may be correctly determined with reference to the position of a base line, when that building is so situated that it is only possible to connect it by one line A C to the main base lines from which an estate is being surveyed. The distance of the point B along the base line being fixed, measure the lengths B D, D C, and C B, so as to be able to plot the triangle B D C, and measure the lengths C E and B E, so as to be able to plot the triangle B C E. Then, if the face of the building, D E, be straight the line C E, when plotted, should appear as a continuation of the line D C.

Fig. 10 shows a method for connecting a base line for an off-road with a main base line. A pole is placed in the middle of the off-road, at E, so as to equalise the offsets upon either side, and another pole higher up the road, not shown in the diagram, but also placed in the centre of this road. A pole is then fixed at C, so as to be in line with the two poles fixed upon the off base line and also upon a point in the main base line B A. The direction of the line C E is determined for purposes of plotting by measuring the sides of the two triangles B E C and C E K, the points B and K being taken upon the main base line B A in such positions that the tie-lines B E and E K touch the corners F and H of the adjacent buildings. Then, by recording the distance of F from B, when measuring B E, and the distance of H from K, when measuring E K, a valuable check upon the position of these corner boundaries is obtained. They are also surveyed in the ordinary way, when taking the offsets measured from both the lines B A and C E. The same method is adopted for fixing the direction of P N in fig. 11, but in fig. 11 the triangles do not extend to the points F and H as in fig. 10. When a piece of open ground exists at one corner, as shown in fig. 10, the lines B A and C E may be connected by the formation of a triangle, C D L, in which C M is measured as a *proof* line. In the triangle B E K the line E C forms the proof line. Upon a hard road, when frequent traffic might upset the position of poles temporarily set up in the centre of the road they may be fixed very often in gully-grates and wedged up. A chalk-mark across the grate will enable the position of any pole to be easily redetermined if disturbed by passing traffic. This method has been supposed to be adopted in fixing the base lines O S and S W in fig. 11.

Fig. 12 shows a method which can be adopted for determining the angle between the sides B E and B F of an old building supposed to be out of the square in plan. The direction of the side B F is first produced by fixing a pole at A, and the direction of the line B E by fixing a pole at C. The measurement of the line A C fixes the angle A B C. A similar plan could be adopted in the case illustrated by fig. 15 for connecting the base lines A D, D C, C B, and B A. At A and C the triangles have been formed in the same way as the triangle N O Q in fig. 11. At B and D the tie lines in the triangles M B L and E D F (fig. 15) are ranged as a check in the same straight line. Figs. 16 and 17 show a method of connecting base lines by chain measurements when the angle formed by the base lines at their intersection is very obtuse. Fig. 18 shows the method adopted for calculating the unmeasured length B E of a base line, B D, after measuring a portion, E D, of this line, and taking the angles at the extremities of the measured portion by viewing a distant object A. Fig. 19 shows a means of arriving at the height of a tower, A C, by taking an angle at D, and measuring the distance equal to B D. If an obstruction prevents the distance B D (fig. 19) being accurately measured, the formula given in fig. 18 may be used, B E in fig. 18 being supposed to correspond with B D in fig. 19.

Various other cases will arise in practice, each of which must be dealt with according to its special circumstances. All we can do is to suggest examples which we think to be of the most frequent occurrence, but we trust the study of the cases we have illustrated may help the student to form a correct judgment in applying main principles to such cases as may come under his care. We have endeavoured to make our articles as practical as possible, and to describe methods of work which we ourselves have found to combine accuracy with expedition.

OWNERSHIP OF DRAWINGS.

SIR,—I have not been able to refer to "Roscoe's Building Cases," quoted by you in reference to this matter, but I am under the impression that "Ebdy *v.* M'Govern" only settled this point, viz., that in the event of the works not having been executed, the drawings should belong to the proprietor, and not to the architect, to enable him (the proprietor) to carry out the building when desired;—as to whom the drawings should belong to after that being quite another matter. I should like to be corrected in this view if I am wrong.

THOMAS OLIVER.

Newcastle-on-Tyne.

NON-ACCEPTANCE OF LOWEST TENDER.

SIR,—Referring to the lists of tenders published by you on the 12th of November last, p. 690, there appears one for a parish room, All Saints, Rotherhithe. It may be seen that out of nine builders my tender was the lowest by 27*l.* After some delay I was again invited to send in an amended tender against one other competitor, with considerable alterations in the specification. This I complied with, submitting a tender for 557*l.*, when, after another three weeks' delay, I was informed by the architect that Messrs. A. White & Co.'s tender had been accepted; but I am still ignorant as to what the amount of that tender was, but was told that the job was postponed until the Spring (but I see it is in full operation).

Now, as to whether it was strictly just to ask me to again compete, your numerous readers will form their own opinions; but surely it could not be right to select a builder who stood fifth from the bottom of the list?

J. BULLERS.

George-row, Bermondsey, Dec. 21.

ALMANACKS AND DIARIES FOR 1888.

"WHITAKER'S ALMANACK" for 1888 (published at 12, Warwick-lane, Paternoster-row) is fuller and more varied in its contents than ever. It has been extended by about forty pages, and several new features have been introduced. It is not quite free from mistakes, but it is nevertheless a remarkable compilation, and the Editor is quite justified in saying that since his almanack was first published, twenty years ago, "You'll find it in Whitaker" has become an oft-repeated remark when information is sought.

Messrs. Hudson & Kearns, of 38, Southwark-street, again send us a parcel of their admirable professional and trade diaries, specially prepared for the use of architects and builders. "The Architect's Diary," adapted for the use of architects, surveyors, and civil engineers, is sent to us in two forms, Nos. 12 and 13,—the first having one page to a day and the second two pages to a day, and sold for 4s. 6d. and 5s. 6d. respectively. These diaries contain a great mass of legal and professional information, and each may be said, in fact, to provide for all possible professional requirements of the kind. "The Builder's Diary," No. 11, selling for 4s. 6d., is planned on the same comprehensive lines, only more so, if anything. These diaries supply a real want, and are well and carefully got-up. The same publishers send us a specimen of their general "Diary for 1888," and samples of their registered date-indicating blotting-pads, of which we have spoken with commendation in former years.

The "City Diary and Almanack" for 1888 (published by W. H. & L. Collingridge, *City Press* Office, Aldersgate-street) is another hardy annual, this being its twenty-fifth appearance. It contains a great deal of information about "the grand old Corporation," as well as other City and metropolitan matters, and is published for one shilling.

Mr. John E. Sears, A.R.I.B.A., sends us "The Architect's, Surveyor's, and Engineer's Compendium" for 1888, edited by himself and published by E. Marlborough & Co., 51, Old Bailey. It fairly merits its sub-title of "Professional and Office Diary and Directory of Manufactures" ("appertaining to building" being understood). Several important improvements have been made in the work; a Certificate-Record is added, and, taking a hint from the *Builder*, a map of London (in sections), showing the boundaries of Surveyors' Districts under the Building Act, is given. In a mere passing notice like this, written immediately the work comes to hand, we cannot, of course, vouch for the accuracy of all the matter therein contained, but, with this reservation, we may commend the publication as one of exceeding usefulness and value for the office.

"The Railway Diary and Officials' Directory" for 1888 (published at the price of one shilling by McCorquodale & Co., Limited, Cardington-street, N.W.) and the "Railway [sheet] Almanack" (sixpence, same publishers) contain much authoritative information and statistics of interest to all who travel and all who own railway stock.

"Calvert's Mechanics' Almanack and Workshop Companion" for 1888 (published by John Heywood, 11, Paternoster-buildings, price 4d.) well maintains its established character for usefulness, though we will not pledge ourselves to the accuracy of all the recipes and formulæ given in it. Some particulars of the renewal of King's Cross Station roof are given (with diagrams) from a paper by Mr. R. M. Bancroft, read before the Society of Engineers this year. It is not generally known that until their renewal, in iron, within the last few years, the arched roof-principals were mainly of wooden planks, laminated, as illustrated in the *Builder* at the time of their erection, about the year 1851. Mr. F. J. Bancroft contributes some useful memoranda on building and engineering matters. Altogether this is a very handy little almanack.

Messrs. Griffith, Farran, & Co., of St. Paul's Churchyard, send us a specimen of Blackwood's Shilling Scribbling Diaries, interleaved with blotting-paper.

From Mr. Alfred S. Tucker, mason, &c., of 143½, Euston-road, we have received a handy little thing for the waistcoat pocket. It is a combination of a four-fold pocket foot rule, with scales of ½ in., ¾ in., 1 in., and 1½ in. to the foot, and a calendar for the year 1888. It is printed in gold, black, and red, and the scales are as accurately divided as is possible by printing. A linen lining runs through the card, so that the joints where it is folded will not easily break or wear. It may be had for twopence, and the profits, if any, will be devoted to a charitable object.

VARIORUM.

The *Insurance Year Book*, 1888 (published by Simpkin, Marshall, & Co., Stationers' Hall-court), is the third issue of a very useful handbook, and it brings to a focus much statistical and other information as to the position of insurance offices. It may be advantageously consulted by persons effecting insurances. It is sold for one shilling.——Some little time ago we received vol. ii. of *The Architects' Register* (published by W. Pope, 16, Holborn, price 2s.). It is very nicely printed, and is mainly filled by reprints of papers read before the Architectural Association and other bodies, but these are not always given fully. This is notably the case with Prof. Corfield's lecture (it was not a written *paper*) on "House Sanitation," of which a full report will be found in the *Builder* for Jan. 29 last.——The *Intelligence Quarterly*, published by W. Bartholomew, 25, Paternoster-row (price 1s.), is a very useful compilation of special information about London and its suburbs, suitable for the wants of visitors, tourists, &c. It contains a large number of maps, and upwards of 80,000 references to streets, public buildings, hotels, &c. But the advertising element is somewhat obtrusive.——The volume of *Transactions of the Manchester Statistical Society*, Session 1886–87 (published by John Heywood, Manchester and London) contains some interesting papers on technical education, co-operation, &c., dealt with, of course, from the statistician's point of view.——From Messrs. Cassell & Co. we receive a parcel of their popular magazines, which are both cheap and good. The *Quiver* (which lately commenced a new and enlarged series) is well illustrated and printed, and among the contributors are the Dean of Canterbury and Professor Blaikie. In the first number of the new volume was a paper on "Noteworthy Church Roofs," with sketches of examples at South Creake, Walsingham, and Knapton, all in the county of Norfolk. *Cassell's Family Magazine* has also just commenced a new volume. It is a very readable and well-illustrated miscellany, containing much useful information as to new inventions and "notions" under the heading "The Gatherer." *Little Folks*, the popular

magazine for children (published by the same firm), commences a new and enlarged series with the January number, and is sure to increase its already great hold upon the favour of parents and children, both for its illustrations and reading matter. Among the contributors is Mr. Walter Crane, whose pencil limns some quaint conceits under the title "Lancelot's Levities," the one representing "A Dandy Lion" being a clever combination of animal and plant life. Each of the three magazines we have named is obtainable for sixpence.——The Religious Tract Society (56, Paternoster-row) send us their old-established and admirable magazines the *Leisure Hour* and the *Sunday at Home*. Both are well illustrated and varied in their contents. In the first-named there is an amusing story entitled "The Defeat of Antiquarius at Thrasymene," which graphically depicts the discomforts of tourists in unfrequented parts of Italy. In an account of "The Late Edward Thring," some interesting particulars are given of Uppingham School, of which Mr. Thring was the well-known head-master. The *Sunday at Home* contains the first of a series of articles on "Paris at the time of the Reformation," by Mr. Richard Heath. The *Girl's Own Paper* and the *Boy's Own Paper* are two other monthly magazines issued from the same office. The former devotes a good deal of space to art industries, and the number for January contains an illustrated paper by C. Harrison Townsend on "Mosaic Work, and How it is Executed." The *Boy's Own Paper* goes in for tales of adventure and deeds of daring, Mr. Talbot Baines Reed and Mr. J. F. Hodgetts being among the contributors. The mysteries of "alley tors" and "commoneys" are no doubt fully treated of in the articles on "Marbles in Twenty Ways." All four magazines are capital in their way, and cost only 6d. each. From the same Society we receive *The Child's Companion* and *Our Little Dots*, two excellent magazines for children, well illustrated and printed. "Little Dots" is specially designed for infants, and the reading is in large clear type. Each of these magazines costs but a penny per month. With the January numbers coloured plates are given. *Friendly Greetings*, *The Cottager and Artisan*, and the *Tract Magazine* are other publications issuing from the same office, but some of the illustrations in these are not up to the mark.——It is announced that Mr. A. Wyon is writing a work on "The Great Seals of England."——Mr. William Muir writes from the "The Blake Press," Edmonton, that he has produced for subscribers, through his agent, Mr. Quaritch, fifty copies each of Wm. Blake's "America" and "Europe" during the year past, and that he hopes to issue his "Urizen," "Song of Los," and "Gates of Paradise" in 1888.——*Decoration*, a monthly journal devoted to the illustration of the decorative arts, and to the interests of the house-painting and art-furnishing trades,—published since its first issue more than seven years ago by Messrs. Sampson Low, Marston, & Co.—will henceforth be published by Mr. P. L. Deighton, at 6, York-street, Covent-garden. He promises some enlargement of the journal, of which Mr. Moyr Smith will continue to act as the art editor.——*Scientific News*, a periodical for general readers, has hitherto been published monthly, but will, beginning with the new year, be published weekly, at 138, Fleet-street. ——"Fair Faces, or Types of Female Beauty," is the title of a special series of full-page engravings, from drawings by Miss Margaret Thomas, to be commenced in the January number of Mr. Francis George Heath's pictorial monthly, *Illustrations*.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

43, Domestic Fire-grates. W. H. H. Marten.

The object of this invention is to provide a double grate capable of being rotated, enabling each of the grates to be utilised for either of the rooms in which they are placed, and assuming there is a fire in only one of the grates, permitting such grate to be turned from one room to the other when desirable.

424, Paving Blocks and Roads. W. White.

According to this invention, asphalte or concrete composition is run into moulds of suitable shape, and having projections and sockets which interlock so as to form a secure paving. Instead of forming the compound block wholly of asphalte or composition, embeded therein are one or more pieces of wood or other suitable material in such wise that the pieces of wood or material appear on the surface of the compound block. This can be conveniently effected by placing the pieces in the bottom of the mould before the asphalte or composition is poured in.

734, Treating Wood. Thomas Royle.

The process of treating wood for the extraction of water, &c., is by this invention carried on by the use of a continued current of heated fluid, and in a more rapid manner than has hitherto been the case. The fluid, such as tar, creosote, &c., is forced into the pores of the wood, so as to take the place of the moisture which is expelled by the preliminary treatment.

12,247, Apparatus for Shaping and Trimming Slate. A. Spamer.

In order to dispense with the cutting plate or template employed when slates are trimmed by the hammer, and to save the time occupied in the preliminary marking of the slates, an apparatus is provided by this invention which claims not only to effect these purposes, but to prevent much of the breaking of the slates when being trimmed for roofing purposes. The table on which the slates are laid is provided with notched marks or gauges, and the knife is made to fall with a double-edged lever, which gives it weight and accuracy in stroke. Curves or shaped lines may be cut with the shears by moving the slate while under the blade of the knives carried by the levers.

12,488, Ventilating, Disinfecting, &c. J. McConnell.

The appliance which is the subject of this patent is actuated by the rotation of propelling fans effected by the flow of water, steam, or compressed air, or other fluid, the pressure required being very low, and is reversible in action, so that by the same apparatus air may be drawn from or admitted into the apartment.

13,656, Fixing Roofs, &c. W. Rickwood.

According to this invention, instead of using zinc, lead, or wire clips, a metal button or plate is pierced to receive nails or screws for fastening the battens to boards. The lower end of the plate is thickened and tapped to receive a screw to be inserted after the roof covering has been placed in position, and is provided with a circular or other shaped button screwed on as far as may be necessary to press upon the slate and thus prevent its rising.

NEW APPLICATIONS FOR PATENTS.

Dec. 16.—17,326, J. Hill, Opening and Closing Fanlights.—17,348. E. Robbins, Clear Crystal Concrete Material, or Buildings entirely of Primary Lights.

Dec. 17.—17,396, R. Dickinson, Slow Combustion Stove Grates.—17,398, E. Tapsell, Utilising the Waste Heat generated by Register and other Stoves for Warming, Ventilating, &c.

Dec. 19.—J. Peacocke, Portable Hut.—17,437, W. Payne, Pivoting Fanlights, &c.—17,451, W. Ridgway, Cranes.—17,458, S. Hollyman and J. Horne, Chimney Top to induce Up-draught.

Dec. 20.—17,470, W. Somers, Preparation for use in Paints and Varnishes.—17,479, J. Roberts, Heating and Ventilating Workshops, &c.—17,483, A. Boult, Concrete Pavements.—17,488, J. Mott & Co., Automatic Bolt and Indicator for Water-closets, &c.—17,503, G. Cook, Spirit Levels.

Dec. 21.—17,539, D. Marshall, Joints for Pipes.—17,546, J. Bennett and J. Telfer, White Lead.—17,556, H. Stockman, Ventilators.—17,588, H. Ball, Opening and Closing Fanlights, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

11,671, G. and A. Needham, Window Fasteners.—15,148, J. Cardwell and J. Chandler, Bolts for Shop Window Shutter Bars, Sliding Sashes, &c.—15,395, R. McGregor, Bricks, Blocks, Tiles, &c.—15,764, J. Stevenson, Fasteners for Windows, Doors, &c.—15,634, J. Gay and F. Wood, Fire Bricks, &c.—16,063, J. Beesley, Fixing and Holding together Scaffold Poles, Ladders, &c.—16,746, W. Wodson and J. Judge, Dressing and Finishing Building Bricks, Flooring Tiles, &c.—16,769, R. Melhuish, Joiner's Parallel Vice.—15,560, B. Finch, Fireproof Partition Doors for Theatres, &c.—16,772, J. Macdonald, Electric Bells.—16,839, C. Dungate, Window, Door, and Similar Arches and Ornaments for Building Purposes.—16,897, L. Goold, Casing and Fixing Locks to Doors.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

2,813, R. Hellyer, Ventilating, Warming, and Illuminating.—4,261, J. Millar, Window Sashes to facilitate Cleaning, Painting, and Glazing from the Inside.—10,689, H. Newcome, Portable Smoke Flue or Chimney.—11,039, J. Kenyon and Others, Preventing the Passage of Wind, Rain, or Dust beneath Doors.—12,919, A. Wells, Revolving Wood Shutters.—15,868, R. Shaw, Drain Pipes, &c.—2,244, F. Taylor, Door Bolts.—2,685, R. Adams, Door Closing Appliances and Checks.—2,992, H. Lewis, Hand or Foot Power Saw Benches.—3,120, E. Taylor, Attaching and Adjusting Knobs to Spindles.—10,050, S. Bromhead, Stone-Sawing Machine.—16,025, E. Boynton, Saws.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

DECEMBER 19.

By A. BOOTH.

Camden-road—Nos. 322 and 324, term 59 years, ground-rent 28*l.* £2,300

H. SMALLMAN.

Hampstead-road—115, Drummond-street, 31 years, ground-rent 8*l.* 275
87 and 89, Robert-street, 36 years, ground-rent 14*l.* 815

WALFORD & WILSHIN.

Battersea—12 and 14, Home-road, 86 years, ground-rent 14*l.* 460

JENKINS & SON.

Deptford—2, Adolphus-street, freehold 380

DECEMBER 20.

By H. W. ILES.

Poplar—An improved ground-rent of 17*l.*, term 40 years 205

By GLOVER & HARRISON.

Poplar, Woolmer-street — The Forester's Arms Beer House, freehold 780
Lower Sydenham, main road—The Man of Kent Beer House, freehold 720

By CHESTERTON & SONS.

Hyde Park—2 and 3, Cleveland-gardens, 66 years, ground-rent 36*l.* 6*s.* 4,950
27, Cleveland-gardens, 62 years, ground-rent 2*l.* 2,450
17 and 20, Cleveland-gardens, 51 years, ground-rent 4*l.* 5,200
28, Cleveland-gardens, 62 years, ground-rent 2*l.* 2,570
7, Gloucester-mews West, 55 years, ground-rent 7*l.* 500
6a, Porchester-mews, 51 years, ground-rent 2*l.* 155
11, 11a, 12 to 16, Leinster-street, 51 years, ground-rent 30*l.* 1,640
Harrow-road—No. 219, term 60 years, ground-rent 8*l.* 575
Pimlico—8, Passmore-street, 34 years, ground-rent 4*l.* 350
Kensington—30, Pembroke-gardens, 59 years, ground-rent 10*l.* 1,340

DECEMBER 22.

By DALE & SON.

Mile End—1 to 11, Swan-court, 16 years, ground-rent 24*l.* 165
Islington—30, Charles-street, 62 years, ground-rent 8*l.* 155
15, Gainford-street, 35 years, ground-rent 6*l.* 250
Stepney Green—Nos. 166 to 180 even, 18 years, ground-rent 150*l.* 270
Bethnal Green—174, Old Ford-road; and 72, Bonner-street, 60 years, ground-rent 4*l.* 1,030

MEETINGS.

MONDAY, JANUARY 2.

Clerks of Works' Association.—General Quarterly Meeting (Carpenters' Hall). 8 p.m.

WEDNESDAY, JANUARY 4.

British Archæological Association.—(1) Mr. J. Romilly Allen, F.S.A.Scot., on "A Museum of Christian Archæology for Great Britain." (2) The Rev. Canon Collier, F.S.A., on "Recent Discoveries in Winchester Cathedral." 8 p.m.

Civil and Mechanical Engineers' Society.—Mr. A. Fairlie Bruce, A.M.I.C.E., on "Salmon Passes." 7 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary meeting. 8·30 p.m.

THURSDAY, JANUARY 5.

Parkes Museum.—Dr. Angel Money on "Hygiene in Childhood." 5 p.m.

FRIDAY, JANUARY 6.

Architectural Association.—Mr. A. Oliver on "Brasses of the Fourteenth and Fifteenth Centuries." 7·30 p.m.

Miscellanea.

Registration of Plumbers in Scotland.—The monthly meeting of the District Council for Forfarshire, Perthshire, and Fifeshire was held in the Town House, Dundee, on Saturday last. Ex-Provost Ballingall presided, and presented certificates of registration to several members of the trade. The secretary drew the attention of the Council to pamphlets which are being circulated in Scotland by a new organisation, which adopts the title of "The Scottish Society for Registration." This title, he remarked, seemed to be wider than the facts warranted, for the aim appeared to be to vest the control of the registration in the hands of four master plumbers, whereas the Ancient Guild of Plumbers of London, founded by Edward III. (commonly called the Worshipful Company of Plumbers), and not connected with any plumbers' societies or trade organisations, was recognised as the only examining and certifying body for the registration of plumbers for the United Kingdom, in conformity with the resolution of the Congress of Metropolitan and Provincial Plumbers, held in London in 1884. The certificates were granted to those who were not only qualified to superintend, but also practically to execute, all branches of the trade. The Council wished to direct the attention of plumbers as a body to the importance of loyally supporting the registration system under the Worshipful Company of Plumbers, that the trade might not become damaged by the action of unqualified men.—*Dundee Advertiser.*

Schools, from an Architect's Point of View.—At a recent meeting of the Worcestershire Association of Church School Managers and Teachers, held at Worcester, the Sheriff (Mr. Ernest Day, architect and surveyor) read a paper on "Schools, from an Architect's Point of View." He said that a good plan for boys' and girls' schools might be carried out by providing a lofty central hall or schoolroom, communicating with class-rooms for boys on the ground-floor, and over these rooms class-rooms for girls communicating with a gallery running round the central hall, the girls of course having separate approaches, but so arranged that they might have access to the central hall to mass the whole school as occasion might require. This plan was on the lines of Sir Titus Salt's schools at Saltaire, but he thought it questionable if the Education Department would sanction such a scheme. In elementary school planning there were some essential points to keep in view. The site should be selected in as central a position as possible in the district where school accommodation was needed. It should if practicable be of ample size to afford good playgrounds and to secure plenty of light and a good circulation of air round the buildings for the purposes of ventilation. Good-sized, properly-paved play-grounds were very desirable in order that children might enjoy reasonable recreation, which added much to their physical strength and greatly augmented their mental faculties. The general arrangement of each school must depend upon the number and classes of children; if a mixed school for, say, 622 children, he should apportion as follows,—allow for boys 171, girls 171, infants 280, and generally a portion of about one-third class accommodation for boys and girls in each case, although where funds allowed he preferred providing a general room and class-room to accommodate respectively all the children in the boys' and girls' schools. The floor area should not be less than 10 ft. per child, except for infants, which would suffice at 8 ft., and the cubical air-space for each boy and girl should be 200 ft., and each infant 130 ft., although the Education Department would sanction a much lower standard.

Water Supply of Cheltenham. — The *Cheltenham Examiner* says:—Some months ago reference was made in our columns and at meetings of the Town Council to a very misleading statement as to the character of the water supply of Cheltenham, made in the report of a committee appointed by the British Association "for the purpose of investigating . . . . the quantity and character of the water supplied to various towns and districts" from the Permeable Formations of England. On attention being drawn to the report it was at once admitted that its reference to the water supply of Cheltenham was founded upon an error, into the origin of which it is not necessary now to inquire; but we are pleased to state that in a later report of the same committee just issued an ample *amende* for the error is made. We quote the paragraph referring to the subject at length:—

"Cheltenham Water Supply is derived from springs issuing at the base of the sands of the Inferior Oolite, which yield a water described by the Rivers Pollution Commission as 'palatable, wholesome, and well-suited for dietetic purposes, and is also much softer than most spring waters from the same strata.' Mr. McLandsborough, C.E., the engineer to the works, states the reservoir holds 200 days' supply, and is delivered on the constant system; he has gauged the springs on the hills above the reservoirs since 1884, and has never found them fail. During the severe drought of 1884 they yielded a volume equal to half the average daily supply of the period gauged. The minimum yield of the spring was in December of 1884, when the reservoirs were more than half full, and would have enabled the Corporation to give a full supply if the drought had continued into the spring of 1885. In the Eleventh Report of your Committee, by a most unfortunate misprint, the reservoirs are described as 'dry' during the drought of 1885, instead of 'short,' as reported by a correspondent, in which statement he was obviously incorrect. Your Committee much regret that the condition of the Cheltenham Waterworks should have been misrepresented by them, as they were fully aware of the ample supply and pure quality given to the town by the Corporation, the purity of which has been testified to by Drs. Allen Miller, Frankland, Way, and Tidy, and Professor Voelcker."

Wilton Park, Beaconsfield, Bucks. — The restoration of the mansion at Wilton Park, at Beaconsfield, Bucks, has been recently completed by Messrs. Bywaters, of King-street, London, under the direction of Mr. Arthur Vernon, architect. This important fabric, in the midst of one of the loveliest parks in the country, had been allowed to become greatly dilapidated during the present century, and a very large outlay has been incurred in the restoration of the mansion, stabling, and out-houses.

Street Improvements at Chelmsford.—The Chelmsford Local Board have recently carried out, under their Surveyor, Mr. Charles Pertwee, extensive street improvements in kerbing and tar-paving footways, the contractors for the kerbing being Messrs. Ringe & Nicholls, of Chelmsford. The kerb is of Hopton Wood and York stone, 12 in. by 4 in. and 12 in. by 5 in. The contractors for the tar-paving were Messrs. A. C. W. Hobman & Co., of London. Mr. James Maddocks, the Board's road foreman, has acted as clerk of works.

Free Church, High Wycombe.—A limited competition has been recently held for the erection of a new Free Church structure at High Wycombe, Bucks. Plans were submitted by Messrs. Paul & Bonella, of London; Mr. Wills, of Derby; Mr. Charles Carter, Great Marlow; Mr. Thos. Thurlow, High Wycombe; and Mr. Arthur Vernon, of High Wycombe. The design by the last-named competitor has been selected. The accommodation required is for 450 persons, and the intended outlay is 2,000*l*.

Artesian Wells.—Messrs. C. Isler & Co. write to say that at Messrs. Seabrooke & Sons, Grays, Essex, an 127 ft. deep artesian bored tube well, including the lining of the same with 5 in. internal diameter pipes, was completed in less than a week, through chalk and flints, the rapidity with which this work was executed being attributed to their improved method of well boring. The same firm are at present engaged at Fulham on the new site of the premises of The Maltose Company, Limited, fixing two 420 ft. artesian bored tube wells, from the designs and under the superintendence of Mr. Arthur Kinder.

Burning of the "Grand" Theatre, Islington.—Early on Thursday morning, and only an hour or two after the building had been crammed with a large audience to witness the pantomime, the Grand Theatre at Islington was completely burnt down (at least, so we gather from the somewhat meagre reports to hand up to the time of our going to press). Fortunately the few persons who were on the premises at the time were rescued, but eleven horses, in stables at the rear belonging to the London General Omnibus Company, were killed by a falling wall, and a young man was injured by the falling *débris*. As to the cause of the fire, it is stated in an evening paper that "from investigations hurriedly made there is little doubt but that the fire broke out on the 'O.P.' side of the stage, a spark from one of the gas jets having probably been blown to some of the scenery and then been fanned into a flame by the back draught after the house was closed." The theatre was only built four years ago, on the site of the previously-existing "Philharmonic" Theatre (formerly a music-hall), which was burnt down in September, 1882. The theatre now destroyed had a seating capacity for 3,000 persons, and was described at the time of its erection as of "fireproof (!) construction," and "planned in conformity with the requirements of the Metropolitan Board of Works." Mr. Frank Matcham was the architect.

The New Junction Railway in North-West London.—The new Junction Railway in North West London, which is to be opened on Monday next, and which will have the effect of bringing into direct communication with each other the two principal railway systems in the country,—the London and North Western and the Great Western lines,—consists of a short line about four miles in length, which leaves the Great Western main line about midway between the Ealing and Acton stations, and proceeding in a south-easterly direction, partly on embankment and partly in cutting, joins the North and South Western Railway near the Acton station of that line, the Great Western Company effecting, by that angular route, a communication with the London and North Western, and also with the North London Companies, at Willesden Junction. In its passage eastward the line runs almost parallel, on the north side, with Uxbridge Road, and High-street, Acton. The new route will place the whole of the North London system, both east and west of Dalston Junction, in immediate communication with the Great Western, and will also enable the last-named company to run their trains from Willesden Junction to Euston Station, as well as to Paddington, under agreement with the London and North Western Company.

National Smoke Abatement Institution.—The annual meeting of the National Smoke Abatement Institution was held a few days since at the offices of the Institution, 2, Victoria Mansions, Westminster, Sir W. F. Pollock in the chair. The report of the Council was read by the secretary, and the proposals submitted by the Council for the programme of the operations for next year were adopted. A series of meetings for the reading and discussion of papers dealing with the subjects of smoke prevention and fuel economy were arranged, and a conference will also be held at which sanitary inspectors and medical officers of health will be invited to attend, in order to compare the existing by-laws, which regulate the emission of smoke in the provinces, and to suggest a basis for further action, with the object of bringing more prominently forward before the public the necessity for the amendment of the existing Smoke Nuisance Acts.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	10	0	7	15	0
Teak, E.I. ....load	8	0	0	12	10	0
Sequoia, U.S. ....foot cube	0	2	3	0	3	0
Ash, Canada ....load	3	0	0	4	10	0
Birch ,, ...	2	0	0	3	10	0
Elm ,, ...	3	10	0	4	10	0
Fir, Dantsic, &c.	1	10	0	4	0	0
Oak ,, ...	2	10	0	4	10	0
Canada	3	0	0	6	0	0
Pine, Canada red	2	0	0	3	10	0
,, yellow	2	0	0	4	0	0
Lath, Dantsic ....fathom	3	0	0	5	0	0
St. Petersburg	4	0	0	5	10	0
Wainscot, Riga ....log	0	0	0	0	0	0
,, Odessa, crown....	2	10	0	3	0	0
Deals, Finland, 2nd and 1st...std.100	7	10	0	9	0	0
,, 4th and 3rd	6	0	0	8	0	0
Riga	5	10	0	7	10	0
St. Petersburg, 1st yellow	8	10	0	14	0	0
,, 2nd ,, ...	7	0	0	8	0	0
,, white	6	10	0	8	0	0
Swedish	6	15	0	15	0	0
White Sea	7	0	0	16	10	0
Canada, Pine, 1st	16	0	0	24	0	0
,, ,, 2nd....	10	0	0	15	10	0
,, ,, 3rd, &c....	7	0	0	9	10	0
,, Spruce, 1st	8	0	0	9	10	0
,, ,, 3rd and 2nd	5	0	0	7	0	0
New Brunswick, &c....	5	0	0	7	0	0
Battens, all kinds	4	0	0	10	10	0
Flooring Boards, sq., 1 in., prepared, First	0	8	0	0	11	6
Second	0	6	6	0	7	6
Other qualities	0	4	0	0	6	0
Cedar, Cuba ....foot	0	0	3½	0	0	3½
Honduras, &c.	0	0	3	0	0	3½
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	4½	0	0	7
St. Domingo, cargo average	0	0	4½	0	0	6
Mexican ,, ...	0	0	3½	0	0	3½
Tobasco ,, ...	0	0	4	0	0	5
Honduras ,, ...	0	0	4	0	0	5
Maple, Bird's-eye	0	0	5	0	0	7
Rose, Rio ....ton	8	0	0	11	0	0
Bahia....	7	0	0	9	0	0
Box, Turkey	5	0	0	12	0	0
Satin, St. Domingo ....foot	0	0	5	0	0	9
Porto Rico	0	0	6	0	0	10
Walnut, Italian	0	0	4	0	0	5½

METALS.						
IRON—Bar, Welsh, in London...ton	0	0	0	0	0	0
,, ,, in Wales	0	0	0	0	0	0
,, Staffordshire, London	0	0	0	0	0	0
COPPER—						
British, cake and ingot ....ton	0	0	0	0	0	0
Best selected	0	0	0	0	0	0
Sheets, strong....	0	0	0	0	0	0
Chili, bars	84	10	0	0	0	0
YELLOW METAL....lb.	0	0	0	0	0	0
LEAD—						
Pig, Spanish ....ton	15	10	0	15	15	0
English, common brands....	15	15	0	15	17	6
Sheet, English	16	15	0	17	0	0
SPELTER—						
Silesian, special ....ton	20	10	0	21	0	0
Ordinary brands....	20	0	0	20	10	0
TIN—						
Straits....ton	167	10	0	0	0	0
Australian	167	10	0	0	0	0
English ingots	0	0	0	0	0	0

OILS.						
Linseed ....ton	19	2	6	19	7	6
Cocoanut, Cochin	29	0	0	30	0	0
Ceylon	23	15	0	0	0	0
Palm, Lagos	21	10	0	22	0	0
Rapeseed, English pale	28	0	0	0	0	0
,, brown	24	15	0	0	0	0
Cottonseed, refined	19	10	0	0	0	0
Tallow and Oleine....	25	0	0	45	0	0
Lubricating, U.S....	5	0	0	6	0	0
,, refined....	5	0	0	12	0	0
TURPENTINE—						
American, in casks ....cwt.	1	8	0	0	0	0
TAR—						
Stockholm ....barrel	0	15	0	0	0	0
Archangel	0	10	0	0	0	0

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Sketch Design for Shop Premises	.....	5*l.* 5s.	Jan. 11th	ii.
New Schools, Guernsey	Managers	5*l.*	Jan. 31st	xix.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Making-up Road	S. Hornsey Local Board	E. Fry.....	Jan. 4th	x.
Wood Paving	Hammersmith Vestry...	*Official*	do.	ii.
Masons' and Paviors' Work, Wood Paving, &c.	Westminster B. of Wks	G. R. W. Wheeler	Jan 3 and 4	x.
Repairs to Roadways	Met. Asylums Board ...	*Official*	Jan. 5th	x.
Road-Making and Paving Works	Hammersmith Vestry...	do.	Jan. 9th	ii.
Repairs of Roads, Buildings, &c.	Met. Asylums Board ...	Pennington & Bridgen...	do.	x.
Pipe-Sewers, &c.	Willesden Local Board	O. Claude Robson	Jan. 10th	xix.
Kerbing, Tarpaving, &c.	Lewisham Bd. of Wks.	*Official*.....	do.	x.
(1) Formation of Footpath. (2) Iron Hurdles.	Met. Board of Works ..	do.	do.	ii.
Removal of Dust, &c.	Crown Est. Paving Com.	do.	Jan. 11th	x.
Works and Materials	St. Marylebone Vestry	do.	Jan. 12th	x.
Breeze, Ashes, and Dusting	do.	do.	do.	x.
Carting away Slop and Sweepings	do.	do.	do.	x.
Watering Streets and Roads	do.	do.	do.	x.
Road Materials	do.	do.	do.	x.
Repairs, &c.	St. Pancras Guardians	do.	Jan. 18th	ii.
Main Sewerage Works.....	Billesdon U.R.S.A.....	J. B Everard.....	Jan. 20th	ii.
Pumping Station	Edmonton Local Board	G. E. Eachus.....	Jan. 24th	x.
Works and Materials	Hackney Board of Wks	J. Lovegrove.....	Jan. 25th	x.
Construction of Aqueduct	Manchester Cor. Wtrwks	G. H. Hill	Feb. 14th	x.
Works and Materials	Liverpool Corporation	*Official*	Not stated...	x.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Borough Surveyor.....	Burnley Cor.	350*l.*	Jan. 7th	xvi.
District Surveyors.....	Met. Board of Works...	Not stated	Jan. 11th	xvi.
Clerk of Works	Billesdon U.R.S.A.....	2*l.* 10s. weekly	Jan. 13th	xvi.
Assistant Surveyor.....	Reigate Town Council..	80*l.*	Jan. 17th	xvi.

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *Noon on Thursdays.*]

KENSAL GREEN.—For alterations and additions to the Tavistock Farm Dairy, for Mr. E. A. Peters. No quantities:—

G. Bowles	£485	0	0
W. Pryor	290	0	0
F. T. Chinchen (accepted)	260	0	0

WAPPING.—For the erection of a warehouse, Granite Wharf. Mr. H. Alexander, architect, 72, Cannon-street, E.C. Quantities by Mr. E. A. B. Crockett, 6, Poultry, E.C.:—

Lunn	£1,855	0	0
H. T. Greenwood.....	1,537	0	0
B. E. Nightingale.....	1,510	0	0
Outhwaite & Son	1,483	0	0

WILLESDEN. — For completing two residences, Craven-park, Willesden. Mr. Walter Hall, surveyor, 38, Chancery-lane:—

F. T. Chinchen.....	£652	0	0
F. J. Wicks	586	0	0
G. S Archer	580	0	0
J. Maling	549	0	0
E. Snooks	520	0	0
J. Parfitt	519	0	0
J. Sharp.....	510	0	0
G. A Sexton	490	0	0
Talbot	485	0	0
J. M. Goodwin.....	480	0	0
G. Baines	405	0	0
W. & G. Jenkins...	390	0	0
Burling & Wood (accepted).....	227	0	0

WALWORTH.—For laying down a new wood carriageway and York stone footways, and executing other works in connexion therewith, for the purposes of the Walworth-road improvement, for the Metropolitan Board of Works. Sir J. W. Bazalgette, engineer:—

C. Dickinson	£2,370	0	0
J. Mowlem & Co.....	2,074	0	0
Stubbs.....	2,013	0	0
Turner & Sons	1,906	0	0
Hindle & Morrish	1,848	0	0
Briggs (accepted conditionally)	1,814	9	0

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G. K.—J. F.—H. H. M. C.—O. R. amounts should be sent).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication

We are compelled to decline pointing out books and giving addresses.

Note.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

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BOX GROUND. | COMBE DOWN.
WESTWOOD GROUND. | STOKE GROUND.

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Doulting Freestone.

THE CHELYNCH STONE. The stone from these quarries is known as the "Weather Beds," and is of a very crystalline nature, and undoubtedly one of the most durable stones in England.

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Greater facilities have been provided for working these quarries, and the stone can be supplied in large quantities at short notice.

Prices, and every information given, on application to CHARLES TRASK & SONS, Norton-sub-Hamdon, near Ilminster, Somerset.

London Agent — Mr. E. WILLIAMS, 16, Craven-street, Strand, W.C. [Advt.

Doulting Free Stone HAM HILL STONE, BLUE LIAS LIME (Ground or Lump), For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [Advt.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [Advt

Asphalte.

Seyssel, Patent Metallic Lava, and White Asphaltes.

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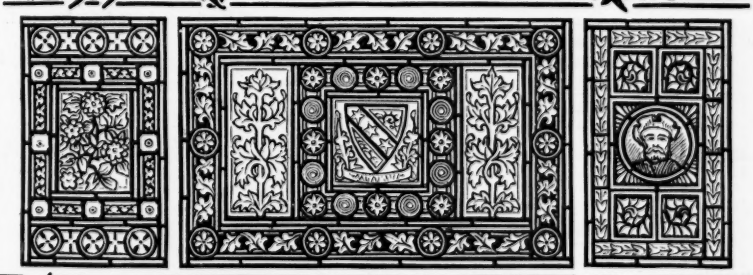

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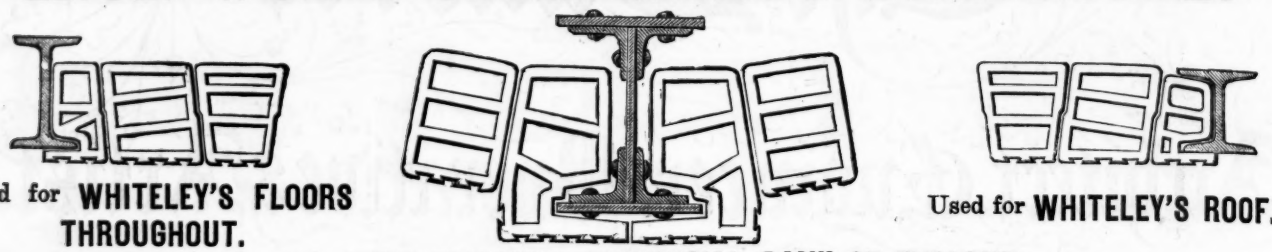

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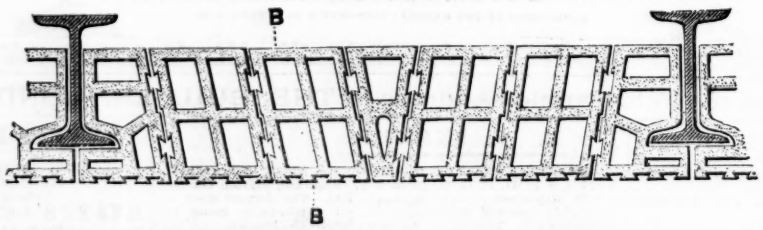

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The author of the successful design will not be employed to carry out the work.

Designs to be sent in under motto with address, in sealed envelope, not later than WEDNESDAY, the 11th of JANUARY, 1888, to J. C. C. care of B. Wheeler, Advertising Agent, Pall-mall, Manchester.

CONTRACTS.

METROPOLITAN BOARD of WORKS.

FORMATION OF PATH AND SUPPLY OF IRON HURDLES.

The Parks, &c. Committee of the Metropolitan Board of Works will meet at the Office of the Board, Spring-gardens, S.W. on WEDNESDAY, the 11th day of JANUARY, 1888, at TWELVE o'clock at Noon precisely, and will then be prepared to open TENDERS by persons who may be willing to Contract for the following separate works:—

1. Formation of a Footpath and other works in connexion therewith, across the North Mill Field, Hackney.

2. Supply and Erection of Wrought-iron Hurdle and other Fencing in Finsbury and Southwark Parks.

Persons desirous to submit Tenders for either or both works may obtain forms of Tender and other particulars, on personal application to the Superintending Architect of the Board, at the Office, Spring Gardens, between the hours of NINE a.m. and FOUR p.m (or on Saturdays between the hours of NINE a.m. and TWO p.m.), until TUESDAY, the 10th day of JANUARY, 1888.

The Tenders, which must be separate, must also be on the form supplied from this Office, and be addressed to "The Clerk of the Board," are to be delivered at the Office before FOUR o'clock on the last-mentioned day, and no Tender will be received after that hour.

Any Tender which is not fully filled up in every particular will be rejected.

The Committee do not bind themselves to accept the lowest or any Tender.

J. E. WAKEFIELD,
Clerk of the Board.

Spring-gardens, S.W.
December 23rd, 1887.

BILLESDON UNION RURAL SANITARY AUTHORITY.

LEICESTERSHIRE.

HUMBERSTONE AND EVINGTON MAIN SEWERAGE.

The Billesdon Union Rural Sanitary Authority are prepared to receive

TENDERS for the MAIN SEWERAGE of the Parishes of Humberstone and Evington, near Leicester:

Comprising the construction of about eight miles in all of Brick and Concrete Sewers, and of 18-in. 15-in. 12-in. and 9-in. Pipe Sewers, with all necessary Manholes, Lampholes, Ventilators, Flushing Chambers, Bellmouths, Junctions, Storm Overflows, and other Works in connexion therewith.

Plans, drawings, conditions, specifications, and quantities may be seen on and after the 20th day of DECEMBER, 1887, at the Offices of the Engineer, Mr. J. B. EVERARD, M. Inst. C.E. 6, Millstone-lane, Leicester, from whom copies of the conditions, specifications, and quantities may be obtained upon payment of three guineas, which will be returned when these documents are returned accompanied by a Tender in the prescribed form.

Tenders, with names of sureties, together with the conditions, specification, and accurately priced quantities to be sent to me on or before FRIDAY, the 20th day of JANUARY, 1888, endorsed "Tender for Humberstone and Evington Main Sewerage."

The Authority do not bind themselves to accept the lowest or any Tender.

THOMAS INGRAM,
Clerk to the Authority.

No 2, New-street, Leicester,
December 24th, 1887.

REVISED ADVERTISEMENT.

ST. PANCRAS.

TO BUILDERS AND OTHERS.

The Guardians of the Poor of this Parish are prepared to receive TENDERS for PAINTING, WHITEWASHING, COLOURING, DISTEMPERING, and other REPAIRS, at the Buildings known as the School of the Royal Society of St. Anne's Asylum, Streatham Hill.

Plans and a specification can be seen on the Premises between the hours of TEN a.m. and FOUR p.m. on the 3rd, 4th, and 5th JANUARY next.

Forms of Tender and copies of the specification can be obtained at the Offices of the Architect, Mr. H. H. BRIDGMAN, F.R.I.B.A. 42, Poultry, E.C. from whom all information can also be obtained.

Tenders, endorsed "Tender for Repairs," are to be sent to me not later than TWELVE Noon on WEDNESDAY, the 18th of JANUARY next.

The Guardians do not bind themselves to accept the lowest or any Tender.

ALFRED A. MILLWARD,
Clerk.

Vestry-hall, Pancras-road, N.W.
December 22nd, 1887.

HAMMERSMITH VESTRY.

TO MASONS, PAVIORS, ROADMAKERS, CONTRACTORS, AND OTHERS.

The Vestry of Hammersmith hereby give notice that they will be prepared at their next Meeting, to be held on WEDNESDAY, the 9th day of JANUARY, 1888, at SIX o'clock in the Afternoon, to receive TENDERS for ROAD-MAKING and PAVING WORKS in Vespan-road, Roxwell-road, and Tabor-road, Hammersmith.

Plans and specifications of the intended Works may be seen, and any further information obtained at the Surveyor's Office, after WEDNESDAY, the 28th day of DECEMBER, 1887.

The Contractors are to attend personally, or be represented at the Vestry meeting, to deliver their own Tenders, to wait until all Tenders are opened, and to answer questions.

The contractor is required to deliver with his Tender a schedule of prices, upon which the value of any extras or omissions shall be based.

The Vestry does not pledge itself to accept the lowest or any Tender.

By order,
W. P. COCKBURN,
Vestry Clerk.

Vestry-hall,
Broadway, Hammersmith, W.
December 22nd, 1887.

HAMMERSMITH VESTRY.

TO WOOD PAVIORS, ROADMAKERS, CONTRACTORS, AND OTHERS.

The Vestry of Hammersmith hereby give Notice that they will be prepared, at their next Meeting, to be held on WEDNESDAY, the 4th day of JANUARY, 1888, at SIX o'clock in the Afternoon, to receive TENDERS for SUPPLYING and LAYING DOWN about 3,130 superficial Yards of WOOD PAVEMENT in a portion of the Uxbridge-road, between the Uxbridge-road Railway Station and the Eastern end of Shepherd's Bush Common.

The Wood Blocks to be laid down are to be Creosoted Beech Wood Blocks to be obtained from Messrs. Armstrong, Addison, & Co. of Sunderland, and no other blocks will be allowed to be used.

Plan and specification of the intended Works may be seen, and any further information obtained, at the Surveyor's Office, on and after WEDNESDAY, the 28th of DECEMBER, 1887.

The Contractors are to attend personally, or be represented at the Vestry Meeting, to deliver their own Tenders, to wait until all Tenders are opened, and to answer questions.

The Contractor is required to deliver with his Tender a schedule of prices, upon which the value of any extras or omissions shall be based.

The Vestry do not pledge themselves to accept the lowest or any Tender.

By order,
W. P. COCKBURN,
Vestry Clerk.

Vestry-hall, Broadway,
Hammersmith, W.
September 29th, 1887.

(Contracts—see also p. x.

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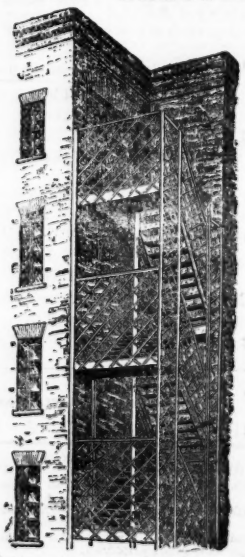

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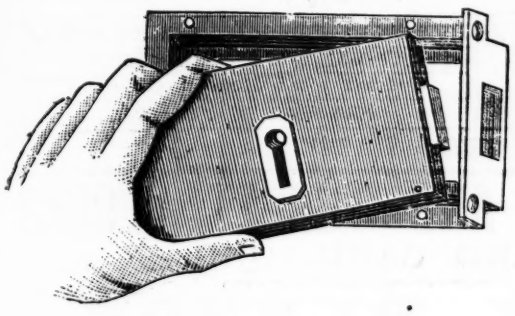

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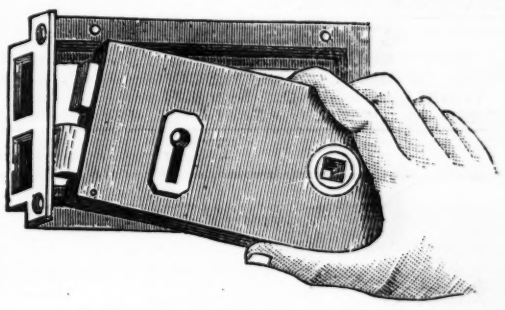

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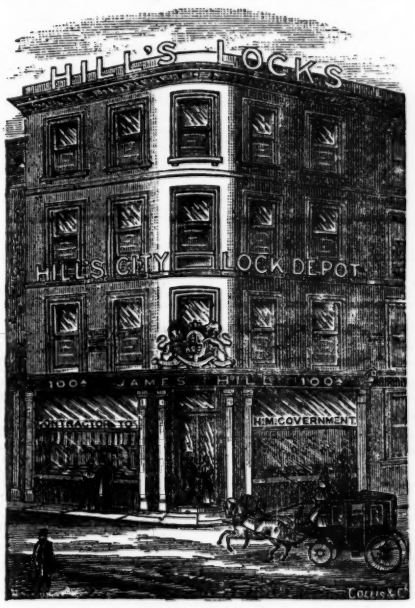

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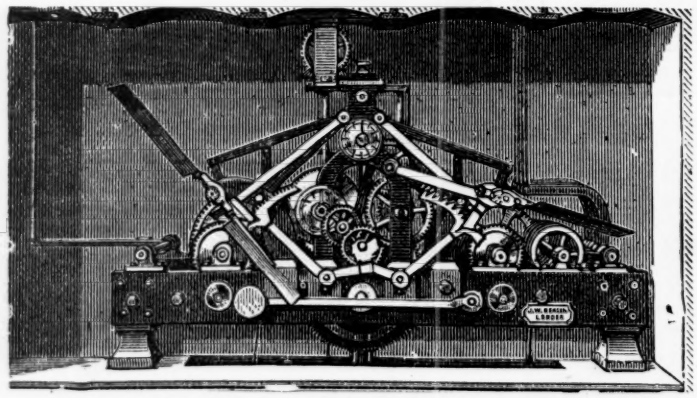

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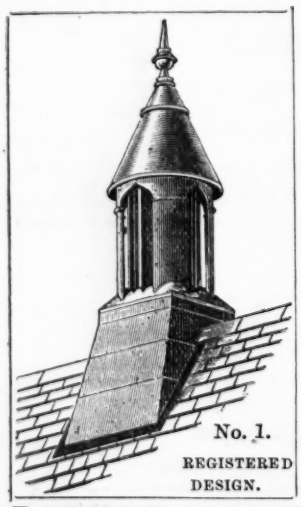

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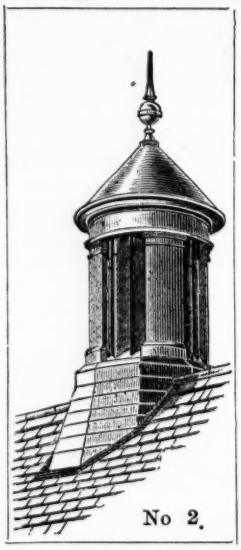

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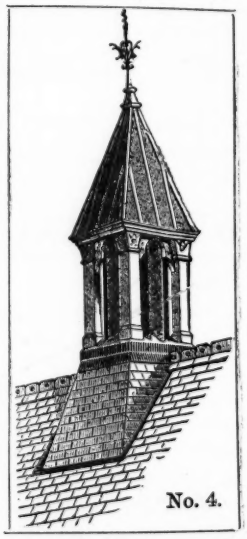

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Vol. LIV.—No. 2344. JANUARY 7, 1888. PRICE 4d., *By Post*, 4½d.
REGISTERED AT THE GENERAL POST OFFICE AS A NEWSPAPER.

THE NEW YEAR'S NUMBER *(which will be published on Friday, January 6th) will contain, amongst others, the following ILLUSTRATIONS viz.:—*

"London in the time of Henry VIII." (WITH KEY).

(*Photo-lithograph*, 48 *in.* × 13 *in.*)
Drawn by H. W. BREWER.

Truro Cathedral—Exterior Views.

(*Two double-page Photo-lithographs.*)
(*a*) From N.E.
(*b*) ,, S.E.

St. Mark's, Venice.

(*Double-page Typo-gravure.*)
View of the Façade fronting the Piazza.

The Fawcett Monument, Westminster Abbey.

(*Double-page Ink Photo.*)
Drawn by GERALD HORSLEY.

Old Putney Bridge (destroyed in 1886).

(*Double-page Photo-Lithograph.*)
Drawn by H. H. STATHAM.
&c. &c. &c.

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The other Members of the Firm (Mr. W. H. Barber and Mr. W. W. Barber) will continue to CARRY ON the PRACTICE at the above Address, under the style of "W. H. Barber & Son."
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C. W. ENGLISH, 69, Chancery-lane, W.C. begs to draw the attention of ARCHITECTS to his OFFICES, where Perspectives are Outlined and Finished in the best style and on short notice.
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METROPOLITAN BOARD of WORKS. ELECTION OF DISTRICT SURVEYORS under the Metropolitan Building Act, 1855.

The Metropolitan Board of Works hereby give Notice that they will, on FRIDAY, the 13th day of JANUARY next, at their Office, Spring-gardens, Charing-cross, at TWELVE o'clock at Noon, proceed to the ELECTION of a SURVEYOR for the District of the Northern Division of the City of London and a SURVEYOR for the District of St Ann, Limehouse, St. John, Wapping, the Precinct of St. Katherine, and the Hamlet of Radcliff.

Applications must be in writing, and, if made for the first time, must be accompanied by a certificate from the Institute of British Architects that the applicant is competent to perform the duties of District Surveyor.

The age of the applicant must also be stated.

Applications must be addressed to "The Clerk of the Metropolitan Board of Works," and delivered at this Office not later than FOUR o'clock on WEDNESDAY, the 11th of JANUARY.

Each Candidate must be in attendance at the meeting of the Board on the 13th of JANUARY.

No Candidate will be eligible for appointment whose age is less than 28 years or exceeds 50 years.

Candidates are prohibited from personally canvassing the members of the Board, and any application not made in strict conformity with the terms of the advertisement will not be laid before the Board.

Information regarding the duties of the office may be obtained in the Superintending Architect's Department.

J. E. WAKEFIELD,
Clerk of the Board.

Spring-gardens,
December 23rd, 1887.

BOROUGH of BURNLEY.

WANTED, a SURVEYOR for this Borough. Salary, 350*l.* per annum. Offices and Assistants provided.

Applications, stating age and experience, and accompanied by recent testimonials, to be in my Office on or before SATURDAY, 7th JANUARY, 1888, addressed Chairman Improvement and Highways Committees, Town Clerk's Office, Burnley, and endorsed "Application, Borough Surveyor."

Canvassing is strictly prohibited.

Copies of the definition of duties may be obtained at my Office.

WALTER SOUTHERN,
Town Clerk.

BOROUGH of REIGATE.

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The Council of the Borough of Reigate invites APPLICATIONS for the APPOINTMENT of an ASSISTANT SURVEYOR, at a salary of 80*l.* a year.

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Applications, with copies of testimonials, are to be sent to me at my Office, Station-road, Redhill, Surrey, under cover, marked "Assistant Surveyor," on or before TUESDAY, the 17th day of JANUARY next.

Given under my hand this 28th day of December, 1887.

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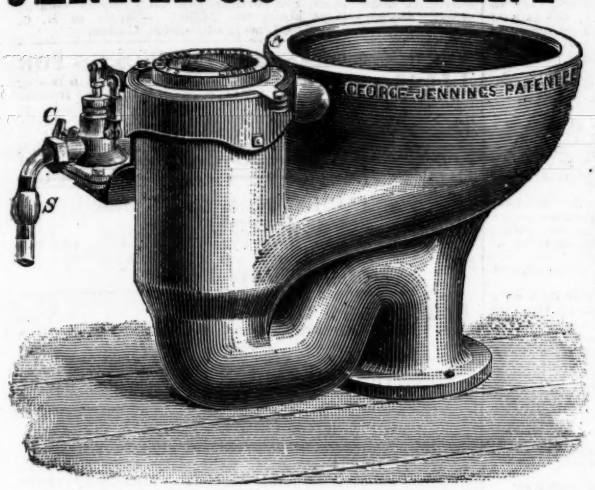

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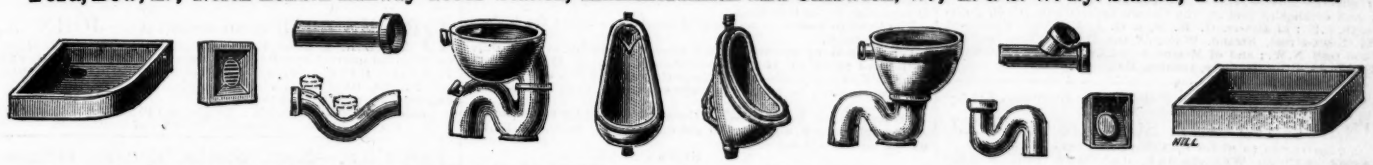

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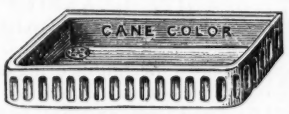

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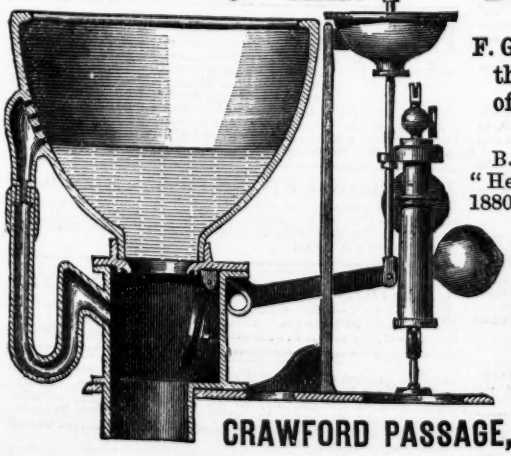

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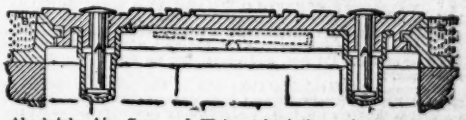

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AUCTIONS (*continued from page* xix.).

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FULLER, HORSEY, SONS, & CASSELL are instructed by the Executors of the late Joseph Firbank, Esq. to SELL by AUCTION, in Lots, at the Midland Railway Company's New Goods Depôt, Midland-road, Euston-road, N.W. on FRIDAY, JANUARY 13, at TWELVE precisely, CONTRACTOR'S PLANT, including a six-wheel coupled locomotive engine by the Hunslet Engine Company, eight horse-power portable engine, two 50-cwt. steam travelling cranes by Wilson, Liverpool, three mortar mills with 7 and 9 feet pans, three five-ton permanent-way trucks, 500 yards of Decauville's steel tram rails, 16-in. gauge, with curves, crossings, and switches; 18 wrought-iron wagons for ditto, several tons bar and scrap iron, chains, ropes, blocks, scaffold poles and boards, barrows and planks, useful timber, firewood, and numerous other effects.—May be viewed the day preceding and morning of Sale, and catalogues had at the Contractor's Offices, 15, Railway-approach, S.E.; of Messrs. G. H. K. & G. A. FISHER, Solicitors, No. 24, Essex-street, Strand, W.C.; at the Depôt Office, No. 106, Midland-road, N.W.; and of Messrs. FULLER, HORSEY, SONS, & CASSELL, 11, Billiter-square, London, E.C.

Portland Cement Works.—On the Medway, near Rochester, Kent.—With possession.—MESSRS.

FULLER, HORSEY, SONS, & CASSELL are instructed to SELL by AUCTION, at the MART, Token-house-yard, E.C. on WEDNESDAY, JANUARY 25th, at TWO precisely, in one lot, the valuable leasehold PORTLAND CEMENT WORKS, situate on the banks of the river Medway, about two miles from Rochester, and known as the Wickham Farm Cement Works, occupying a total area of about thirty-eight acres, together with the plant, machinery, gearing, &c. thereon. The premises comprise a factory, 162 ft. by 50 ft.; substantially brick-built engine-house, with 40-h.p. combined engine and boiler, by Robey; stores and drying room with 35 chambers, range of 9 kilns, a mill-house fitted with 2 wash-mills, pumps, &c. and chimney shaft. The works have been erected on the most approved modern plan, and only require a very moderate additional outlay to be completed. Held on lease for an unexpired term of about 54 years at a ground-rent of 20*l.* per annum, and subject to royalties.—Particulars and conditions of Sale may be had of ARTHUR E. GREVILLE, Esq. Solicitor, Towcester; Messrs. ROBINSON, PRESTON, & STOW, 35, Lincoln's Inn-fields, W.C.; the Bull Hotel, Rochester; at the Mart; and of Messrs. FULLER, HORSEY, SONS, & CASSELL, 11, Billiter-square, London, E.C.

FOY, MORGAN, & CO. beg to announce that their Next PUBLIC AUCTION, originally fixed for 4th JANUARY, 1888, is POSTPONED to 19th JANUARY, 1888, at the BALTIC SALE-ROOM, Threadneedle-street, E.C. when they will offer their usual assortment of DEALS, BATTENS, BOARDS, TIMBER, &c.

Catalogues will be issued in due time.

FOY, MORGAN, & CO. { Wood Brokers, 88, Bishopsgate-street Within, E.C.

By order of the Metropolitan Board of Works.—St. George-in-the East.—Tench-street Scheme.

MESSRS. S. WALKER & RUNTZ will SELL by AUCTION, at the MART, on WEDNESDAY, JAN. 11th, at TWO, in one lot, the compact FREEHOLD BUILDING ESTATE, situate near to the London Docks, the Shadwell Stations on the Great Eastern and East London Railways, and in a locality where dwellings for the industrial classes are much needed. The site occupies an area of about two acres, and has a frontage of 354 ft. to Green-bank, Wapping, and a frontage of 251 ft. to Tench-street, St. George-in-the-East. The purchaser will have to erect on a portion of the site to the satisfaction of the Board and the Home Secretary dwellings for the working classes, and capable of accommodating 1,284 persons, and may devote the remainder of the site to any commercial purposes. A deposit of 10*l.* per cent. on the purchase-money will have to be paid on signing the contract, and the balance without interest at the expiration of one year.—Particulars, with plan and conditions of sale, may be obtained at the Estate Office, Metropolitan Board of Works, Spring-gardens, S.W.; at the Mart; and at the Auctioneers' Offices, 22, Moorgate-street, E.C.

FREEHOLD LAND WANTED.

The Guardians of the Poor of the Parish of St. Giles, Camberwell, require a suitable FREEHOLD SITE in or near to the Parish, not less than four acres in extent, for the erection of an infirmary or workhouse as may hereafter be determined upon. Replies stating situation and extent of land, whether there are any buildings thereon, and terms for purchase, to be sent before the 12th JANUARY next to

CHAS. S. STEVENS,
Clerk to the Guardians.

Guardians' Offices, Peckham-road, S.E.
December 12th, 1887.

TO BUILDERS, INVESTORS, and OTHERS.

TO BE LET, upon Building Lease, the very eligible FREEHOLD PREMISES, No. 30, Tottenham Court-road. Frontage, about 20 feet area, about 1,500 feet. Advances, if required.—For particulars, apply to Mr. ALEXANDER PEEBLES, Architect, 3, Salters' Hall-court, Cannon-street, E.C.

TO BUILDERS and SPECULATORS.—

About Twenty Acres BUILDING LAND at Lingfield, Surrey, TO BE SOLD, by Mortgagee in possession, for 1,560*l.* Ground-rents 7,000*l.* can be created. Possession of land may be had for 100*l.* the remainder by instalments. Immense bargain.—Apply, T. MULLETT ELLIS, Architect, 28, Essex-street, Strand.

FOR SALE.

VALUABLE FREEHOLD WHARF AND WAREHOUSES, TO BE SOLD, with immediate possession, a very desirable and valuable FREEHOLD RIVERSIDE WHARF, situate near Rochester Bridge, on the River' Medway, Kent, having a well-built frontage to the river of about 114 feet, and containing an area of about 23,000 feet super.

The property is divided in the centre by the main road leading to the S.E. Railway Station, Strood, thus giving a double road frontage (as well as the river frontage), and affording good approaches for the transport of goods to and from the warehouses.

Part of the land is covered by several strongly-built corn store-houses, giving a storage area of about 15,000 feet super. also stables, offices, and two wharfingers' dwelling-houses.

The above premises are admirably adapted for a Corn or Timber Merchant, or for the erection of a Manufactory.

For further particulars apply to GEORGE PEPPER, Chartered Accountant and Auctioneer, No. 6, The Paddock, Chatham, Kent.

FREEHOLD GROUND-RENTS.

CITY OF LONDON

The Commissioners of Sewers of the City of London will meet in the GUILDHALL of the said City on TUESDAY, the 24th of JANUARY, 1888, at HALF-PAST TWELVE o'clock precisely, to receive TENDERS for the PURCHASE of the valuable FREEHOLD GROUND-RENTS and REVERSIONS of PREMISES, as under, viz.:—

Nos. 85 to 91, Queen-street	at a Ground-rent of	£550	per ann.
,, 92 to 94, Queen-street	,,	,,	400	,,
,, 70, 71, Cheapside, and 95 to 99, Queen-street	,,	,,	660	,,
No. 9, Warwick-lane	,,	,,	70	,,
,, 13, Warwick-lane	,,	,,	160	,,
Nos. 63, 64, Gracechurch-street	,,	,,	840	,,

Particulars and plans of the Premises may be had at this Office, together with the conditions of sale.

Tenders must be sealed, endorsed outside, "Tender for Freehold Ground-rent, 85 to 91, Queen-street," &c. (stating the Premises as the case may be), and be addressed to the undersigned, at this Office, and must be delivered before TWELVE o'clock on the said day of treaty.

The Commissioners do not bind themselves to accept the highest or any Tender.

Parties sending in proposals must attend personally or by a duly authorised Agent at HALF-PAST TWELVE o'clock on the said day, and be then prepared (if their Tender be accepted) to pay the required deposit of 10 per cent. on the purchase-money, and to execute an agreement for the completion of the purchase, agreeably to the conditions of sale.

HENRY BLAKE,
Principal Clerk.

Sewers Office, Guildhall,
November, 1887.

FREEHOLD BUILDING GROUND,

CITY OF LONDON.

IN THE NEW APPROACH TO BILLINGSGATE MARKET.

The Commissioners of Sewers of the City of London will meet in the GUILDHALL of the said City, on TUESDAY, the 24th of JANUARY, 1888, at HALF-PAST TWELVE o'clock precisely, to receive TENDERS for TAKING on BUILDING LEASES, for a term of 80 years, several PLOTS of very valuable FREEHOLD GROUND, in Monument-yard, between Pudding-lane and Botolph-lane, and between Love-lane and St. Mary-at-Hill, and abutting upon the new street extension to Billingsgate Market.

Further particulars, with conditions and printed forms of proposal may be had on application at the Office of the Engineer to the Commission in the Guildhall.

The Commissioners do not bind themselves to accept the highest or any proposal.

Persons making proposals must attend personally, or by a duly authorised agent, on the above-mentioned day, at HALF-PAST TWELVE o'clock precisely, and the parties whose offers are accepted will be required to execute an agreement and bond at the same time.

Proposals must be endorsed on the outside "Tender for Ground," and be delivered in, addressed to the undersigned, before TWELVE o'clock on the said day of treaty.

HENRY BLAKE,
Principal Clerk.

Sewers Office, Guildhall,
December, 1887.

FREEHOLD BUILDING LAND to be LET

or SOLD at Wandsworth, with good water frontage. Suitable for the erection of Warehouses or Manufacturing Premises.

Apply to Mr. JAMES STIFF,
High-street, Lambeth.

Keys with Mr. Miller, 2, Wharf-road, Frogmore, Wandsworth.

FREEHOLD BUILDING LAND, close to

Vauxhall Station, having a frontage of 150 ft. to Bond-street, and a superficial area of about 9,300 ft. TO BE LET on Building Lease, suitable for artisans' dwellings, manufacturing premises, &c. —Apply to Mr. ALFRED J. HOPKINS, Architect, 27, Mortimer-street, Regent-street, W.

FREEHOLD BUILDING LAND TO BE

LET or SOLD, in Plots, at Walham-green, main road. 'Buses to Victoria and City pass through the Estate. The houses are letting and selling before they are finished.—Apply to G. W. THORNTON, Wire Elm Lodge, Munster-road, Fulham, S.W.

FREEHOLD BUILDING LAND, main

thoroughfare, close to Farringdon-street Station.—A FINE SITE containing over 15,000 feet, double frontage. Also a smaller Site opposite, containing 4,900 sq. ft. with new chimney-shaft already built, TO BE LET on 99 years lease; or freehold may be treated for.—For plan and particulars apply to Messrs. THURGOOD & MARTIN, Surveyors, 27, Chancery-lane; or FRANCIS CHAMBERS, Esq. 11a, College Hill, Cannon-street, E.C.

HARROW-ON-THE-HILL.—Mount Park

Estate.—Excellent FREEHOLD BUILDING SITES, well timbered, on high ground, facing south, TO BE LET or SOLD at low prices. Every facility given to responsible builders and others. The Colne Valley water mains supply the estate.—Apply to RAVENSCROFT, HILLS, & WOODWARD, 15, John-street, Bedford-row, W.C.

WANDSWORTH. — Large Waterside

WHARF TO BE LET or SOLD.—For the last seven years it has been used as a Lime and Cement Wharf. Water frontage, 190 feet; area, 16,600 square feet, with office and foreman's house, stables, lime and cement stores or sheds, with good entrance.—Inquire of Mr. JAMES STIFF, High-street, Lambeth, S.E.

A COMMANDING CORNER SITE in

Shaftesbury-avenue, next to Bloomsbury-street, TO BE LET, on Building Lease, upon reasonable terms. Splendid position, and light upon three sides. Finances if required, or Premises would be built to suit occupier.—Apply to Mr. ALEXANDER PEEBLES, Architect, 3, Salters' Hall-court, Cannon-street, City.

TO BUILDERS, INVESTORS, and

PUBLICANS.—TO BE LET upon Lease, the "Ship and Star," fully licensed, in the City of London, adjoining the Minories, and the main approach to the Tower Bridge, in construction.—Particulars of Mr. ALEXANDER PEEBLES, 3, Salters' Hall-court, Cannon-street, E.C.

TO BE LET on a BUILDING LEASE.

The Worshipful Company of Skinners are prepared TO LET, upon a BUILDING LEASE, the valuable FREEHOLD LAND, of about 2,650 feet super. situate at the junction of Whiskin-street and Skinner-street, in the Parish of St. James, Clerkenwell, E.C.

All Tenders must be delivered at Skinners' Hall on or before the 17th day of JANUARY, at TWELVE o'clock Noon.

For further particulars, and form of Tender, apply to EDWARD H. BURNELL, 32, Bedford-row, London, W.C. Surveyor to the Company.

TO BE LET on a BUILDING LEASE.

The Worshipful Company of Skinners are prepared TO LET, upon a BUILDING LEASE, the valuable FREEHOLD LAND, of about 15,000 feet super. situate at the junction of Whiskin-street, Skinner-street, Coburg-street, and Plumbers-row, in the Parish of St. James, Clerkenwell.

All Tenders must be delivered at Skinners Hall on or before the 17th day of JANUARY, at TWELVE o'clock Noon.

For further particulars and form of Tender apply to EDWARD H. BURNELL, 32, Bedford-row, London, W.C. Surveyor to the Company.

[Auctions, &c., see also p. xix.

FREEHOLD BRICKFIELD, at Eltham, in

work, TO BE LET or SOLD, by order of the Mortgagees. Foreman's house, office, five cottages, and machinery in working order. Annual output about two millions.—Apply to H. C. NEWMARCH, Surveyor, 35, Lincoln's Inn-fields, London.

BRICK WORKS and TILE WORKS FOR

SALE, or TO BE LET, about one mile from a fast increasing town in Surrey, easy distance from London. Fifteen acres freehold land, most of it available for building purposes. Engine, machinery, large drying-sheds, two large kilns and usual brickmaker's plant, six-stall stable and hay-loft. In full working order; last season's make 3,000,000. Death of proprietor reason for disposal.—For full particulars as to price, &c. address Box 163, Office of "The Builder."

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Kinds of CLAMP BRICKS, and FLINT MERCHANTS,
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H. CHAMBERS, Abbey Brickfields, Faversham, having a Siding on the London, Chatham, and Dover Railway, direct into the Works, is prepared to SUPPLY BRICKS of every description, either by Truck or Barge, on the shortest notice, and on the most advantageous terms.—Apply as above, or to BRUNTON'S WHARF POTTERIES, Stepney, E.

D. & C. RUTTER,

Manufacturers of

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BRICKS, YELLOW FACINGS, and PAVIORS for SHIPPING Fields,—Great Wakering, Essex; Crayford, Kent; and West Drayton, Middlesex. Offices:—41 and 42, Parliament-street Westminster, S.W.

CHARLES RICHARDSON,

Brunswick Wharf, Vauxhall, and 6, South Wharf, Paddington
Cement Works: Conyer's Quay, Teynham,
BRICKFIELDS,
Teynham, Kent, and Wood-lane, Shepherd's Bush, W.
ED FACINGS, MALMS, STOCKS, GAULT BRICKS, &c. supplied by Barge or Truck

BRICKS (to close an account).—JOHN A.

TAYLOR, 1, Metal Exchange-buildings, Gracechurch-street, has received instructions from the owners of the Field to OFFER FOR SALE HALF A MILLION of best hard STOCKS, GRIZZELS, and PLACE BRICKS, made this season, at the following prices, delivered at our Wharf on the river:—

Stocks, 24s.; Grizzels, 22s.; Roughs and Place, 19s. net cash.
Orders will receive attention in order of application.

BRICKS.—Kent Stocks, Roughs, Grizzles,

and Place, &c.—HENRY MILLICHAMP & CO. Limited, adjacent to the London, Chatham, and Dover Railway Co.'s Station at Teynham, Kent, are prepared to SUPPLY any of the above BRICKS by Barge or Rail, at the shortest notice, on favourable terms.

Apply, 3, KING STREET, CHEAPSIDE, E.C.; or Frognal Brickfields, Teynham, Kent.

ABERDEEN GRANITE WORKS.

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Quarries and Works, Peterhead and Aberdeen, N.B. Depôt in London, 373, Euston-road, where numerous examples of Architectural and Monumental work may be seen.

For Designs and Information address Granite Works, Aberdeen, or to 373, EUSTON ROAD, N.W. Columns and all circular work done at specially low prices by new patent process.

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STONE.—PORTLAND SERIES, of which

Salisbury Cathedral is built, also used in the restoration of Westminster Abbey and Chapter House, Chichester and Rochester Cathedrals, St. Alban's Abbey, many Churches, Mansions, &c.

Price of block, sawn or worked stone, steps, paving, walling stone, rough blocks for engineering purposes, &c. on application to T. P. LILLY, Gillingham, Dorset

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Paving Setts and Curbs.
Blocks for Engineering & Architectural Work.
Monuments, Columns, Pilasters, &c., in Polished Grey and Red Granite.

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Merchants in all kinds of STONE and GRANITE.

Depôts, adjoining the Commercial Surrey Docks, Rotherhithe, and Millbank-street, Westminster, where estimates may be obtained for deliveries, either by vessel or rail, to all parts of the kingdom.
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KENTISH RAG STONE. Quarries: The

SCRUBBS QUARRIES, Maidstone, and the celebrated ALLINGTON QUARRIES, Allington, near Maidstone, Proprietor JOSEPH S. GABRIEL. Orders executed by barge or rail, for Headers, Kerb, Spalls, and Broken Stone. Also for Kentish Rag Stone, specially broken by Machinery, for Tar Paving and Concrete purposes. The above Quarries offer the most unrivalled facilities for the supply in large quantities of the above-mentioned materials.—For particulars apply to JOSEPH S. GABRIEL, Grellier's and Canterbury Wharfs, Belvedere road, London, S.E.

PORTLAND STONE, Weston Quarries.—

STONE of the best quality, and of any dimensions, may be had, by applying to the Agent, Mr. JONATHAN C. LANG, Portland; or to Mr. H. WELLER, London Agent. Depôt, Nine Elms South-Western Railway.

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PANY.—FOR SALE, SHARES.—FIFTY fully-paid up 10*l.* SHARES FOR SALE. Paying good dividend, likely to be increased.—Apply to Mr. F. J. DOWSETT, Solicitor, Great Yarmouth.

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